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HFP SERIES

INSTRUMENT DIVISION

PROGRAMMABLE POWER SUPPLIES

DOCUMENT NO. 120086-01

OPERATING AND SERVICE MANUAL

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SYSTRON DONNER
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Concord, California 94518

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June, 1985

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HFP SERIES POWER SUPPLY

SAFETY PRACTICES

Personnel assigned to the operation or maintenance of the HFP Series Power Supplies are encouraged to review the safety practices given in this section. These are recommended procedures which may prevent a serious accident, save a life, or protect the instrument from damage.

Whenever the safety of operating or maintenance personnel is involved, special safety instructions are inserted in the text as "WARNINGS". Instructions concerning the safety of equipment are inserted as "CAUTIONS". These notations are discussed in greater detail at the end of this section.

The following recommended procedures should be understood and applied during any phase of operation or maintenance of this equipment:

CHASSIS GROUNDING

Prior to applying power to the unit, determine that the internal protective power ground is connected to the protective ground conductor of the power cord. This ground, in turn, must be connected through the external power cord to the grounded power outlet. (Verify ground continuity using an ohmmeter, with power totally removed from the instrument.)

a. Any interruption of the protective ground conductor, inside or outside of the power supply, could create a potentially hazardous condition due to possible (chassis) voltage differences between this and other equipments. When connected into a system with other units, all power grounds should connect through a common bus to optimize circuit breaker response in the event of electrical failure. Intentional interruption of the grounding system by the use of two-wire plug adapters or two-wire extension cords must be considered an unsafe practice.

b. Whenever it is determined that the protective ground system has been impaired, the equipment must be made inoperative or be secured against inadvertent operation until the deficiency is corrected.

KEEP AWAY FROM LIVE CIRCUITS

Operating and maintenance personnel are cautioned against using the power supply with cover panels removed and power applied, unless directed to do so by a specific instruction manual procedure (troubleshooting, calibration, etc).

a. Under certain conditions, dangerous potentials may still exist when power is removed from the instrument due to charges retained by capacitors. To avoid injury, always remove power; then, discharge or ground any large capacitors prior to replacing components or making repairs.

b. To avoid potential damage to the power supply, always remove power from the instrument before extracting or inserting any circuit boards and/or discrete components.

c. Troubleshooting, repair, or adjustments of the power supply with power applied to the circuits should be minimized whenever possible. However, when instruction manual procedures so dictate, these should be performed only by skilled technical persons who are aware of the various hazards involved.

DO NOT SERVICE OR ADJUST ALONE

Under no circumstances should any person service or adjust equipment unless in the presence of another person who is capable of rendering first aid/ resusitation services in the event of an accident.

DEFECTIVE PARTS REPLACEMENT

To avoid possible damage or degrading of instrument performance, technical personnel are cautioned to replace defective components only with new factory replacement items; or, in certain cases, cross-referenced, direct-substitute items. Be certain that only the correct power fuse with required rating (voltage/current) and specified type (fast blow, slow blow, etc) is used for replacement purposes. The use of repaired fuses or short circuiting of the fuseholder is considered an unsafe practice.

SAFETY SUMMARY

The following safety and special symbols are used on the HFP Power Supplies and/or in this manual.

or Indicates earth (ground) terminal

CHAPTER 1

GENERAL INFORMATION

1-1. INTRODUCTION

1-2. This operating and service manual contains information relating to the installation, operation, maintenance and calibration of the Systron Donner HFP Series Power Supplies.

1-3. The information contained in this manual is divided into front matter and six descriptive chapters, indicated in the following format.

Front Matter: includes the title page, warranty policy, proprietary rights statement, list of effective pages and Table of contents.

Chapter 1 — General Information: contains a general description of the HFP Series and safety practices.

Chapter 2 — Installation and Operation: describes unpacking and receiving inspection, installation criteria, system interface with the P6/P12 Programmers, power requirements, connection to loads and/or units under test (UUT). Instructions on preparation for reshipment are also provided.

Chapter 3 — Principles of Operation: provides a functional description of the Power Supply and is referenced to schematic diagrams located in Chapter 6 of this manual.

Chapter 4 — Maintenance: describes the steps required for routine maintenance, inspection, and alignment.

Chapter 5 — Replaceable Parts: component parts are listed in this chapter along with parts ordering information and manufacturer's code-to-name index.

Chapter 6 — Drawings: provides technical personnel with the required schematics and component location diagrams to support maintenance and troubleshooting of the HFP Power Supplies.

1-4. EFFECTIVITY OF MANUAL

1-5. Information contained in this operating and service manual is date-coded at the bottom of each page. A summary of these date codes is given in the List of Effective Pages (A page) located within the front matter of this manual. Any future changes to this manual will be reflected in the List of Effective Pages.

1-6. DESCRIPTION

1-7. The HFP Supplies are modular in design to allow a compact multiple output programmable system configuration for use in automatic test equipment (ATE) systems when used in conjunction with the P6/P12 Programmers. The P6/P12 Programmers will allow up to fifteen power supplies to be controlled via a General Purpose Interface Bus (GPIB) which conforms to IEEE STD 488-1978. Refer to P6/P12 Programmer Operating and Service Manual.

1-8. Each HFP module is a compact, precision, dissipative regulator, housed in a half rack chassis thus, allowing a compact multiple output rack assembly. Systron Donner RA5 rack assemblies provide the rack mounting for the power supplies and their associated P6 Programmers.

1-9. SPECIFICATIONS

1-10. Table 1-1 provides the performance specifications for each supply in the HFP Series.

1-11. ENVIRONMENTAL AND PHYSICAL CHARACTERISTICS

1-12. Table 1-2 lists the environmental and physical characteristics of the HFP. Figure 6-1 provides an outline drawing with dimensional data.

1-13. SAFETY PRACTICES

1-14. Prior to operation or maintenance of the HFP Series Power Supplies, Technical personnel are encouraged to review all safety procedures in this manual. Removal of the cover panels while the Power Supply has line power applied, exposes personnel to possible contact with high voltage and high current sources. Always remove line power from the unit when servicing, and only allow qualified personnel to maintain this Power Supply.

Table 1-1. Specifications

HFP Series

Line Regulation		Current Mode
90% to 110% Vac	<.001% E_R	<.005% I_R
Load Regulation		
0 to 100% Load	<.002% E_R	<1 mA
Stability over 8 Hrs @		
Constant Line, Load & Temp.	<.005% E_R	<.02% I_R
TEMPCO, /°C	<.005% E_R	<.01% I_R
PARD, rms	<.002% E_R or 1 mV whichever is greater	<.02% I_R TYP <.1% I_R MAX.
Response to PGM Change		
10% Change	<0.5 ms	
100% Change (up or down)	<2.0 ms	

Control of Voltage, Current and 0V
0 to +10V at 0 to 1 mA
(For 0V 10V = 110% E_R)

Maximum Voltage Drop Per Lead When Remote Sensing:
Supplies rated 2A & Less: 0.5V
Supplies rated over 2A: 1.0V

Voltage Recovery to within 0.1% E_R for a Step Current Increase from 10 to 100%:
50 μs TYP, 100 μs MAX.

Front Panel Status Lights:
Voltage Mode: Green LED
Current Mode: Yellow LED
Overvoltage or Crowbar: Red LED
Output Relay Closed: Orange LED

Optically Isolated Status Flags on Control Connector:
(Ground True, Sink One TTL Load)
Voltage Mode
Current Mode
0V
Output Relay Closed
Over Temperature

NOTE: 0V Flag with Voltage Mode Flag shows V_{LIM} condition.
0V Flag without VM Flag shows CROWBARRED condition.

Table 1-1. Specifications — Continued

Crowbar:	Useable from 3V to 112% E_R Triggers at NOM. 2% E_R above V_{LIM} (0V) setting
	Time: 100 μs Delay Nominal
	Control Latches: Can be reset by "RST:CHXX" command.
Isolation:	Either output may be up to 500V above ground.

Table 1-2. HFP Series Environmental and Physical Characteristics

Storage Temperature	-40 to +75°C
Operating Temperature	0 to 50°C
Operating Humidity	0 to 95% relative, noncondensing
Altitude, Operating	10,000 ft (3050 m)
Vibration (MIL-STD-810)	0.33 mm at 5 to 55 Hz
Power	115/208/230 V rms ±10% 47 to 63 Hz 900 Watts maximum
Dimensions:	
Height	5.22 in (13.25 cm)
Width	8.22 in (20.88 cm)
Depth	18.83 in (47.83 cm)
Front Panel Handle Projection	1.50 in (3.81 cm)
Weight:	
Shipping	40 lbs (18 kg)
Net	35 lbs (16 kg)

CHAPTER 2

INSTALLATION AND OPERATION

2-1. INTRODUCTION

2-2. This chapter outlines the procedures for initial inspection, installation and operation of the HFP Power Supplies. Instructions concerning preparation for reshipment are also included should the Power Supply be returned to Systron Donner for service or repair.

2-3. RECEIVING INSPECTION

2-4. Prior to accepting the power supply from the shipper, inspect the condition of the shipping container for any indication of freight damage. Any sign of such damage must be noted by both the shipper and receiver and should be reported to the insurance investigator.

2-5. Immediately following the removal of the power supply from the shipping carton, inspect for possible physical damage incurred during shipment. Check external surfaces for scratches or dents and note the condition of all connectors, circuit breakers, etc. that protrude from the front and rear panels of the rack assemblies. Should any damage be detected, notify your nearest Systron Donner representative — DO NOT USE THE INSTRUMENT UNTIL INSTRUCTED TO DO SO BY THE REPRESENTATIVE.

2-6. PREPARATION FOR RESHIPMENT

2-7. When the Power Supply is repackaged for shipment, use original packing materials or package in accordance with MIL-P-116 and MIL-E-17555E specifications. Repackage the instrument using the following step procedures:

1. Attach an identification tag to the system indicating model and serial number, name and address of instrument owner, and a summary of the service or repairs required.

2. Wrap the assemblies in sheets of heavy paper or plastic prior to placing it in the shipping container.

3. Select a strong carton or wooden box as a shipping container.

4. Use an adequate layer of shock absorbing material on all six sides of the unit. Protect the instrument front panel and panels with additional layers of cardboard. Ensure that no movement of the assembly is evident within the container.

5. Seal shipping container with strong tape or metal bands. Attach a packing list to the outside surface.

6. Mark shipping container "FRAGILE-DELICATE INSTRUMENT" and attach the appropriate handling systems to ensure reasonable care in transit.

7. Be certain all correspondence relating to service or repair of the system includes information contained on the power supply identification tag.

2-8. INSTALLATION

2-9. The HFP Power Supplies are designed to mount into the Systron Donner RA5 rack assemblies. Two half rack power supplies may be installed into a RA5 rack assembly. Rear panel shear alignment pins, guide holes and front panel captive module locking fasteners, provide for the installation of the module into the RA5 Rack Assembly.

2-10. The RA5 Rack Assembly requires a rack space envelope of 5.22 in (13.25 cm) high, 16.97 in (43.10 cm) wide and 22 in (55.88 cm) deep; 3 in (7.62 cm) of the depth requirement is for rear panel protrusion and clearance of cables and connectors. The RA5 rack assembly is provided with provisions for installation of rack mounting slides.

2-11. OPERATING ENVIRONMENT

2-12. Each HFP Series Power Supply has been designed to meet the following environmental requirements:

Operating temperature:	0 to +50°C.
Non-operating temperature:	-40 to +75°C.

Humidity: 0 to 95% relative non-condensing.

2-13. POWER REQUIREMENTS

2-14. All HFP Supplies require 115/230 V ac ±10% 47 to 63 Hz line power. Power consumption is 900 watts maximum. A heavy duty 3 wire detachable line cord with molded NEMA type 5-15P plug provides for the input power connection via rear panel IEC type connector J1.

2-15. The power supply is shipped from the factory normally wired for 115 V unless it was ordered with a 230 V system or requested by the customer that high voltage operation can be provided. Prior to operation ensure that the unit is wired for the correct line voltage application. To reconfigure input line voltage rewire the primary windings of transformer T1 in accordance with the table on the schematic diagram.

2-16. The Power Supply is provided with a front panel 10 A circuit breaker CB1 which provides overload protection and facilitates the application and removal of the line power. When changing from 115 to 208 V or higher, the circuit breaker must be changed to a 2 pole 5A unit to maintain proper supply protection.

WARNING

Before applying power, ensure that the protective ground terminals of the Power Supply module is connected to the protective conductor of the (mains) power cord. The cord plug shall only be inserted into an outlet provided with protective ground contact. The protective conductor must not be negated by the use of an extension cord without a protective grounding conductor.

2-17. The power handling ability of the ac mains feeding the ac power to the line cords must be considered as serious losses in regulation and substantial increase in ripple can occur as a consequence of insufficient power handling capacity of these mains. The impedance from the breaker box to the Power Supply input receptacle should not exceed 0.1 ohm. All ac feed line connections must be securely tightened and any moveable electric contact surface (such as the wiper arm of a variable transformer) should be kept clean of impedance producing oxide coatings.

2-18. OUTPUT CONNECTIONS

2-19. The output of the Power Supply is provided on a rear panel circular twist lock connector J3. The required mating connector is supplied. Table 2-1 provides the connector type and the pin designations for the output connector J3.

Table 2-1. Output Connectors and Pin Designations

FUNCTION	MODEL	
	HFP 30-15	HFP 150-2/3
Output Connector		
J3	MS3102A20-15S	KPT00A14-5S-Y
Mate	MS3106B20-15P	KPT06B14-5P-Y
+V Pin (s)	A, B	B
+S	F	C
-V	C, D	E
-S	E	D
Ground	G	A

2-20. The +V output and + sense and -V output and - sense connector pins may be jumpered to allow local sensing, or sense leads can be connected to the UUT load to allow remote sensing, noting however, that a voltage drop of 1.0 V per power lead must not be exceeded.

NOTE

If sense leads are not connected to the UUT or the connector +V and -V output pins, the Power Supply regulation cannot be maintained. The Power Supply outputs must be configured for either local or remote sensing. However, built-in circuitry is provided to protect the Power Supplies and load from damage should a sense lead or jumper open.

2-21. When interfacing the Power Supplies output with the UUT loads, ascertain if local or remote sensing is to be used. If local sensing is used, ensure that the sense pins are jumpered to the V pins at the mating connector. If remote sensing is used connect sense leads between the + sense pin and - sense pin

of the mating connector and the UUT load. If long sensing leads are required, they should be a shielded twisted pair, with the shield grounded at the Power Supply mating connector pin and the load end left open.

2-22. Ensure that the power leads connecting the + V and - V output of the Power Supply to the UUT load is of sufficient gage to carry the maximum current rating of the Power Supply outputs (a minimum of 500 circular mils per ampere is recommended).

2-23. To determine the proper wire size (AWG) for load leads, a nomograph (figure 2-1) is provided. The wire size is determined by two factors: maximum current carrying capacity recommended for any AWG (500 circular mils per ampere) and maximum tolerable voltage drop across a load lead (1.0 V per lead).

2-24. To find maximum current capacity for standard wire size (AWG), lay a straight edge from the AWG on scale 2 to point A on scale 3, then read the maximum current off scale 1. To find the voltage drop in mV/ft for a known wire size and operating current, lay a straight edge from the operating current on scale 1 to the AWG on scale 2. Then read the voltage drop on scale 3. To find the wire size required for a known operating current and the maximum tolerable voltage drop across the supply leads, first ascertain the maximum tolerable IR drop in mV/ft of lead (sum of the positive and negative leads). Then lay a straight edge from this value on scale 3 to the known maximum operating current on scale 1 and read the wire size in AWG on scale 2.

2-25. FRONT PANEL

2-26. The meters, indicators, circuit breaker and other features located on the front panel of the Power Supply are described in Table 2-2 and shown on the outline drawing, Figure 6-1.

2-27. REAR PANEL

2-28. The connectors are described in Table 2-3. Figure 6-1 depicts their location. Table 2-1 provides the pin designations for output connector J3. Pin designations for the programming connector J2 are provided in Table 2-4.

Table 2-2. Front Panel Functions

Name	Function
AC ON	A 10 A circuit breaker, provides overload protection and facilitates the application and removal of the line power.
VOLTS	A voltmeter, indicates the output voltage of the Power Supply as part of option 30.
AMPERES	An ammeter, indicates the current being supplied to the load. Specify option 30.
CLOSED	An orange LED indicator, illuminates when the output relay is closed, indicating that the output of the Power Supply is being applied to rear panel output connector J3.
VOLTAGE MODE	A green LED indicator, illuminates when the Power Supply is operating in the voltage stabilization mode.
CURRENT MODE	A yellow LED indicator, illuminates when the Power Supply is operating in the current stabilization mode.
0V	A red LED indicator illuminates when the Power Supply is in the voltage limit (V_{LIM}) mode. If the supply is latched in the Crowbar state the Voltage Mode green LED will extinguish.
	A captive module locking fasteners, secures the Power Supply module into the RA5 rack assembly. Rotate CCW to disengage and CW to engage.

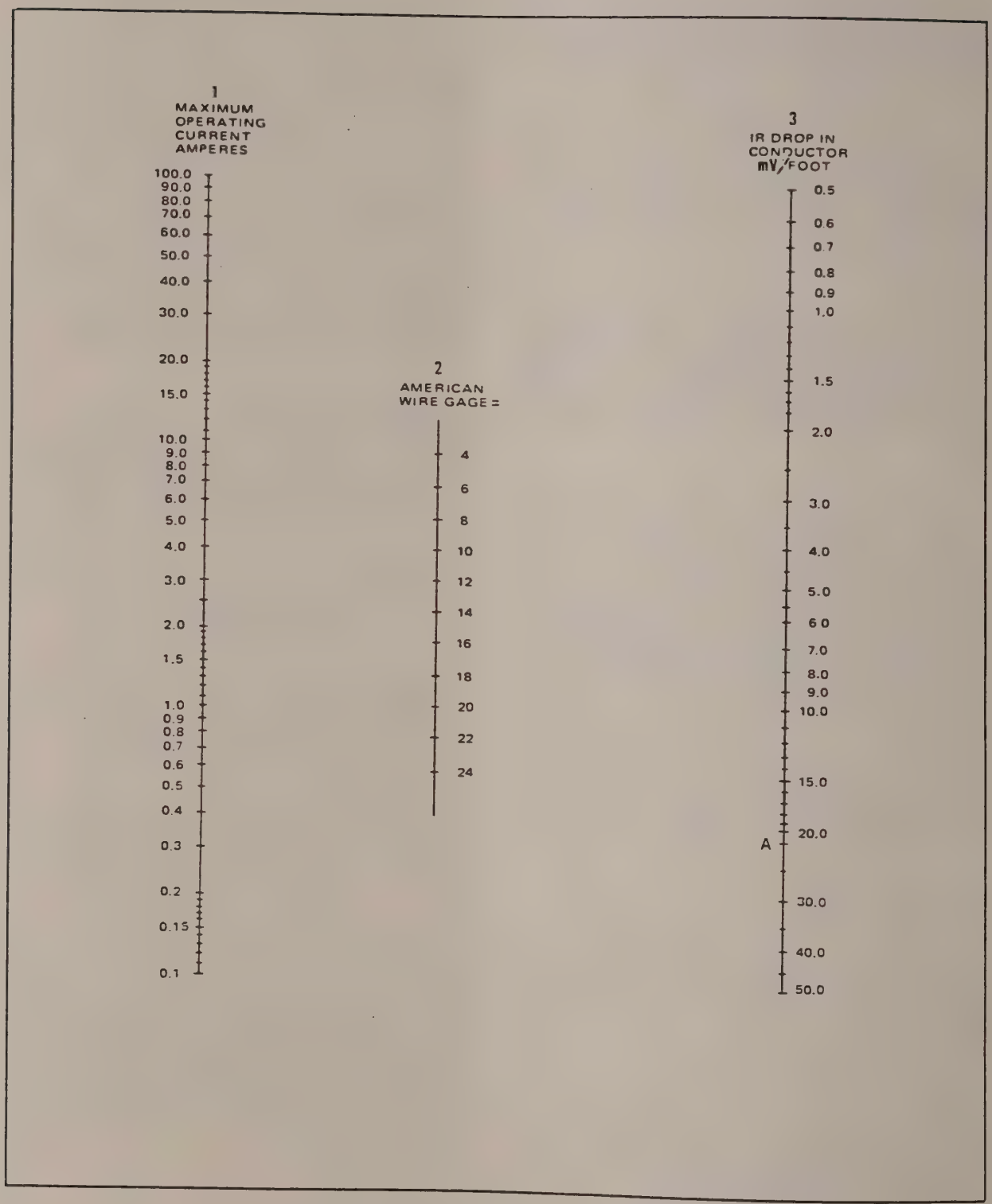


Figure 2-1. Load Lead Wire Size Nomograph

CHAPTER 3

PRINCIPLES OF OPERATION

3-1. INTRODUCTION

3-2. The following functional description is referenced to the HFP Series schematic diagrams located in chapter 6 of this manual.

3-3. FUNCTIONAL DESCRIPTION

3-4. The overall function of the Power Supply is to transform and rectify the ac input line voltage into a well regulated, stable and adjustable dc output. In performing this function, the circuitry is divided into the following subfunctions:

1. Main Power Circuit.
2. Auxiliary Power Circuit.
3. Voltage Stabilization and Control.
4. Current Stabilization and Control.
5. Overvoltage Circuitry.
6. Shut-down Circuits.
7. Output Relay Functions.

3-5. MAIN POWER CIRCUIT

3-6. All power for the supply is fed through the detachable line cord to the rear panel connector J1. Front panel mounted circuit breaker CB1 provides protection from overload fault conditions and for the application and removal of line power.

3-7. Transformer T1 is the power source. The primary can be strapped for 115, 208 or 230 V ac line operation. For the higher voltages a lower current circuit breaker must be used. The fan, which is rated at 115 V, is always connected across one primary winding. When strapped for high line voltage, the primaries act like an auto-transformer to supply the correct reduced voltage to the fan.

3-8. The main load is supplied by secondary 7-8-9. Its output is rectified by bridge CR1 and filtered by capacitors C3 and C4 connected in series. Because of the center-tap connection to the filter mid point, the voltage across each capacitor is one half of the total bridge output. It may be thought of as two full-wave-center-tap rectifiers connected back-to-back. Resistors R1 and R2 function as bleeders to discharge the filter capacitors when power is removed.

WARNING

Before servicing any HFP module, always wait at least one minute after power is removed. This is to allow the filter capacitors sufficient time to discharge to a non-hazardous potential.

3-9. The series pass regulating transistors are Q4 through Q9, all connected in parallel. For low output voltages, their collector voltage (and current) is supplied through CR2. Switch Q1 is turned off. For outputs somewhat above half and up to full voltage FET switch Q1 is turned on making the full raw voltage available for the load. Under this condition CR2 is reverse biased and no current flows through it. The purpose of this circuitry is to reduce the power that the pass transistors must dissipate at low output voltages.

3-10. FET switch Q1 is controlled by A2, the switch control PCB, located under the heat sinks. Refer to figure 6-25, schematic 7-079235 in chapter 6. At a low output voltage the half level raw DC at terminal 1 is high compared to the +V output on pin 6. Thus comparator input U2-5 is more positive than U2-6, making output pin 7 high. Optocoupler U1 is off and the inverted comparator output at pin 1 is low, effectively putting R7 in parallel with R6. As the output voltage is raised the "half level raw DC" decreases relative to +V. When this source voltage, which is effectively the collector voltage of the pass transistors, goes below approximately 5 V for the HFP 150 or about 2.9V for the HFP 30, the divided down voltage on U2-5 goes below the dc level on U2-6. Output U2-7 then switches to low and turns on opto coupler U1. Collector U1-6 goes low relative to U1-5 and diverts the base drive for Q1 coming through R2. Q1 turns off, and the voltage on its collector which is connected to the FET switch gate rises to about 10 V, the full output of the floating rectifier CR1, C1. The main FET switch turns on hard and applies the full raw voltage to the pass transistors. When U2-7 goes low it's inverted output at pin 1 goes high (open circuit) removing R7 from the DC divider. The voltage on U2-6 then rises. This positive feedback creates a hysteresis which prevents the switch circuit from chattering. As a result when the output voltage is

being decreased it must go lower before the switch turns off. For the HFP 150 the switch point is at about 9.5V, for the HFP 30 at about 4.5V.

3-11. Output from the pass transistors is fed through the current metering shunt R10 (located between the fan and the heat sink) and then to the output relay(s). The shunt output also connects to the current sinking transistor Q2, the crowbar SCR CR3, the reverse voltage protection diode CR4 and the main output filter capacitor C5. For units rated at 5 amperes or less the normal and optional reverse polarity relays are mounted on the Relay PCB A3. For higher current units larger relays are used. These are mounted on the chassis and controlled from the relay PCB.

3-12. AUXILIARY POWER CIRCUIT

3-13. Additional fixed voltages are required to operate the control circuitry of the Power Supply. This is obtained from T1 secondary 10-11-12 which is applied to the A1 Control PC Assembly auxiliary rectifier A1CR1. Bridge rectifier A1CR1 and filter capacitors A1C1 and A1C2, supply raw +22 V to A1U7, a +15 V IC voltage regulator and raw -22 V to A1U8 and A1U9 which are -6 V and -15 V IC voltage regulators.

NOTE

The auxiliary Power Supply voltages are referenced to the A1 Control PC Assembly power common which is symbolized as (△) on the schematic diagrams.

3-14. VOLTAGE STABILIZATION AND CONTROL

3-15. In the voltage stabilization mode, the output voltage of the power supply is controlled by the combination of voltage control amplifier A1U1, emitter follower A1Q1, sense amplifier A1U4 and the heat sink mounted series pass transistor Q3 driving Q4 through Q9. They form the major part of a closed loop, negative feedback control system. The output stage (pass transistors) function as an inverter when measuring from +V, thus A1U1 input pin 3 is actually the inverting input. Pin 2 is then the noninverting or reference input and is connected to +V via A1R5.

NOTE

On the schematic +V is indicated by an inverted triangle symbol (▽), which is the signal common reference for the control functions.

3-16. The input resistance to A1U1 pin 3 is the series combination of A1R1, A1R2 and A1R3. It is adjusted by potentiometer A1R1 (V CAL) to a nominal 10 kΩ. The input voltage from 0 to +10 V is referenced to +V (▽) and is supplied by the DAC Assembly in the P6/P12 Programmer. The feedback resistor A1R4 receives the $-V_n$ (normalized -V) signal from the sense feedback amplifier A1U4. $-V_n$ ranges from 0 to -10 V and is also referenced to +V (▽). The ratio of power supply output voltage (at the sense terminals) to the programming voltage is determined by the ratio of R30+R31 to R28+R29. For good common mode rejection in shifting the reference to +V, the ratio of R34+R26+R69 to R27 must also match.

3-17. Transistor Q4 supplies a small reverse current to the Power Supplies output. To program 0 V output will require the pass transistor to flow an equal current. This allows the voltage amplifier U1 to provide control at 0 or near 0 V output and allows for a small leakage current in the pass transistors.

3-18. CURRENT SINK CIRCUIT

3-19. The output of A1U1-6 is normally between 1.8 V and 3.5 V. Hence A1Q2 is normally biased off. However during down programming, A1U1-6 will go negative until the output of the Power Supply drops to its programmed lower value. This negative potential turns on A1Q2 via A1CR4 and A1R17. Transistor A1Q2 is current limited to about 2 mA by resistor A1R19 and by diodes A1CR12 and A1CR13. This A1Q2 current supplies gate drive to the "pull down" FET Q2 located under the Heat Sink Assembly. The pull down FET, current limited by source resistor A2R9 and A1Q6, discharge C5 and any external load capacitance. Hence the output supply voltage can be "pulled down" rapidly from a high output voltage.

3-20. CURRENT STABILIZATION AND CONTROL

3-21. The current stabilization and control function will sharply limit the amount of current which can be delivered to the load. The current supplied is obviously a function of the load impedance: no load no current; short circuit maximum programmed current. The crossover from constant voltage to constant current stabilization mode is automatic. The point at which the stabilization mode switches over is a function of the load and occurs at a critical value of the load resistance R_C = Ep/Ip, where Ep is the programmed voltage value and Ip is the programmed current value.

3-22. Current control is provided by operational amplifier A1U3. A sampling of the output current is provided by the voltage drop across the current measuring shunt R10. The input side of the shunt is connected to A1U3-2 via A1R16 as a reference level. The other input pin 3 is the summing junction and is connected to the negative feedback current from A1R12 (I CAL) potentiometer and resistor A1R13 and the current control 0 to 10 V programming level from the DAC PC Assembly in the P6/P12 Programmer. In the current stabilization mode, these two currents are equal and opposite so that the potential on pins 2 and 3 are equal. The shunt R10 resistance is chosen so that a full rated output current will develop a corresponding -1 mA through R13 and R12. Thus, the current control input current is from 0 to +1 mA.

3-23. The output of the operational amplifier A1U3-6 is connected through diode A1CR14 to pin 8 of A1U1. Pin 8 serves as an auxiliary input to the voltage amplifier and will control its output at pin 6. When operating in the current mode the input to A1U3-3 is only slightly negative so that the output at pin 6 goes low enough to control the loop.

3-24. When the Power Supply is not in the current mode, isolation diode A1CR14 is back biased and the current amplifier A1U3 has no effect on the power supply operation. A1U3-6 is also connected to inverter A1U11-6, which feeds inverter drivers A1U12-6 and A1U12-2 in tandem. Inverter driver A1U12-6 connects through optical isolator A1U6-3 to the front panel CURRENT MODE LED DS3. It generates an isolated current flag at A1J1-14 when the current amplifier A1U3 has control of the loop. Inverter driver A1U12-2 connects through optical isolator A1U5-3 to the front panel VOLTAGE MODE LED DS1. It generates an isolated voltage mode flag at connector A1J1-15 when not in the current mode.

3-25. OVERVOLTAGE CIRCUITRY

3-26. Operational amplifier A1U2B is the voltage limit (V_{LIM}) control amplifier. The reference input pin 6 is connected to +V through A1R40. Pin 5 is the summing junction: the feedback resistor is A1R37 and valued at 11.00 kΩ. The programmed voltage applied to the V_{LIM} input at A1R36 (valued at 10.00 kΩ) is normally higher than the voltage programming input to the A1R1. Thus, the output voltage of the power supply is normally below the V_{LIM} set point. Under these conditions the positive input current to A1U2B is greater than the feedback current. The excess from the summing junction flows through diode A1CR23 to +V. The net effect is a positive potential being placed on A1U2B-5, which drives the output A1U2B-7 positive. This positive potential causes CR16 to be back-biased and hence A1U2B will not control the output of A1U1. When the output-voltage exceeds the V_{LIM} setpoint, however, a negative potential is placed on A1U2B-5 driving A1U2B-7 negative. Isolating diode A1CR16 conducts, and allows, A1U2B to control the output of A1U1 instead of the voltage control programming input at A1U1-3. Any further increase in the voltage programming input at A1U1-3 will have no effect, because the Power Supply output is clamped and controlled by the V_{LIM} setpoint by A1U2B.

3-27. A1U2B output at pin 7 is also connected to inverter A1U11-4 which feeds inverter driver A1U12-4. Inverter driver A1U12-4 connects to optical isolator A1U5-2 and then to the power supplies front panel OV LED DS4. It generates an isolated overvoltage flag at A1J1-13 when the V_{LIM} amplifier A1U2B is controlling the unit.

3-28. The overvoltage (crowbar) function provides additional protection and operates in conjunction with the V_{LIM} circuit. Its purpose is to ensure that the output voltage does not exceed a maximum preset level under external or internal fault conditions by placing a short (crowbar) across the output of the Power Supply if the output voltage exceeds the V_{LIM} setting by 2% of the rated output.

3-29. This is accomplished by amplifier A1U2A which together with its associated circuit components functions as a latching comparator. Its noninverting input pin 3 is connected to the corresponding input on the V_{LIM} amplifier (A1U2B-5) through resistor A1R38. Therefore it receives the same signal relative to the output versus the limiting setting. However, its output (A1U2-1) does not change sign (from + to -) when the V_{LIM} amplifier takes control because the reference input is biased at -0.1 V by resistors A1R41 and A1R42. If the V_{LIM} circuit cannot control the output, either by reducing the drive to the pass transistors or operating the current sink circuit and the power supply output goes up an additional 2% of rated output, A1U2-3 will go negative with respect to pin 2. At this point, the output at A1U2-1 will go negative, which is feedback via diode A1CR25 and resistor A1R39 to A1U2-3. This will latch up the comparator in its overvoltage state.

3-30. Comparator A1U2A has three outputs. The first one via Zener A1CR34, turns on transistor driver

A1Q3 which generates a current pulse at its collector to fire the crowbar SCR CR3 located under the Heat Sink Assembly. When the SCR fires, it rapidly pulls down any voltage present at the power supply output to less than 1 V.

3-31. The second output of A1U2A is via isolating diode A1CR15 to A1U1-8. This is a somewhat redundant series pass drive pull-down, duplicated by the V_{LIM} amplifier A1U2B via diode A1CR16. This pull-down will remain as long as A1U2A stays latched.

3-32. The third output of A1U2A operates the OV flag and front panel 0V LED indicator via inverter A1U11-2. Diodes A1CR26, A1CR27 and inverter A1U11-4 form a NOR gate such that if either the V_{LIM} amplifier (A1U2B) is in control or the crowbar comparator (A1U2A) is latched, the output at A1U12-4 will be low. In order to differentiate between a V_{LIM} overvoltage condition and an overvoltage which generated a crowbar, it is configured so that the crowbar latch extinguishes the VOLTAGE MODE LED and drops the VM flag. This is done by inverter A1U12-12 which goes low only when the supply is crowbarred. Its output pulls down the input of driver A1U12-2 via diode A1CR28, which sets A1U12-2 high.

3-33. Once the fault condition that caused the crowbar is cleared, A1U2A can be reset (unlatched) by a positive OV Latch Reset pulse via connector A1J1-19.

3-34. POWER SUPPLY SHUT-DOWN FUNCTION

3-35. Amplifier A1U13 provides for the shut-down of the power supply via diode A1CR17 to pin 8 of A1U1, when a $\overline{SD}$ gate from the A3 Relay Assembly is generated on a power supply open/close or polarity reversal operation. The Power Supply will also shut-down when the Heat Sink Assembly exceeds a temperature of 131°C causing the overtemperature switch on the Heat Sink Assembly to close. When this switch closes, a low is placed on A1U13-3 via CR30 so that CR17 conducts, also causing a shut-down of the Power Supply. A low is placed on optical isolator A1U6-2 which generates an isolated over-temperature flag at connector A1J1-11.

3-36. SINGLE AND DUAL POLARITY OUTPUT RELAY FUNCTIONS

3-37. Relay Assembly A3 provides the logic and relay switching for single polarity and for dual polarity output relay open/close operations. Four different PCB configurations are provided for in the HFP Power Supply Series. For the lower current units $\leq$ 5 A, mercury reed relays, mounted on the Relay Board are used for main power output switching. For the higher current supplies mercury plunger relays are used, mounted off the Relay Board.

3-38. The single polarity board using two reed relays will be explained first. Raw +22 V output from the auxiliary rectifier A1CR1 is applied to A3J2-5 to provide relay solenoid voltage and input to the +5 V on board voltage regulator U5. Exclusive NOR gates U1-4 and U1-11 function as a state change detector and will generate an inverted pulse at U1-11 when the $\overline{CLS}$ signal from J2-3 changes state. Dual one-shot multivibrator U2 will trigger on the positive edge. One-shot U2-6 will generate a 10 ms duration pulse on the detection of an open/close operation command, which is inverted by U1-10 to generate the $\overline{SD}$ output at J2-2. This shut down signal is applied to the A1 PC Assembly which will shut down the Power Supply for a 10 ms period. The purpose of this shutdown is to rapidly reduce the output voltage of the supply to zero before the relay contacts move to either close or open the circuit. This prevents arcing which could seriously reduce the life of the relay. One-shot U2-10 operates at the same time to produce a 5 ms pulse which serves to delay the application of a close command through gate U4. This allows additional time for the shutdown to work, however its main function is to prevent relay overlap in a dual polarity system. When the load relay K2 is closed, a $\overline{CLSD}$ flag is generated via optoisolator U6 and applied to the A1 PC Assembly from A2J2-6 and -7. From there it is fed back to the P6/P12 Programmer via A1J1-12.

3-39. The dual polarity board has two additional mercury reed relays, K3 and K4, installed. When energized, these connect the supply to the output connector with interchanged polarity. The $\overline{REV}$ signal comes in on J2-1. Gate pack U3 combines it with the close command. When both are true (low) U3-4 is low, thus driving Q3 and Q4 through U4-10 and U4-11. If Reverse Polarity is not true (high) then U3-11 is low when closed and the normal polarity transistors Q1 and Q2 are driven. Exclusive NOR gate U1-3 functions as a state change detector and generates a pulse at U1-11 when the $\overline{REV}$ signal from J2-1 changes state. Thus a shutdown and a relay close delay also occur with a polarity change. The Closed flag is active if either the normal relay K2 or the reverse polarity relay K4 is energized.

3-40. For the higher current units, when the load relays are mounted on the chassis, the $\overline{SD}$ pulse width is increased to 120 ms, while the pulse width from U2-10 is increased to 60 ms. This increase is due to the slower operating time of the mercury plunger relays as compared with the mercury reed relays.

CHAPTER 4

MAINTENANCE

4-1. INTRODUCTION

4-2. This chapter contains the procedures for preventative maintenance and calibration for the HFP Power Supplies.

4-3. PREVENTATIVE MAINTENANCE

4-4. Preventative maintenance consists primarily of cleaning and visual inspection. When performed on schedule, preventive maintenance will prevent possible power supply breakdown and improve the reliability of the Power Supply. Severity of environment, to which the power supply is subjected, will determine the frequency of the periodic maintenance. A convenient time to perform preventive maintenance is just before recalibration.

4-5. Fan Maintenance

4-6. The fan in each member of the HFP series should be replaced every 40,000 hours of operation. New fans should be ordered from the manufacturer or from Systron Donner.

4-7. Interior Cleaning

4-8. Dust on the interior of the power supply must be removed due to its electrical conductivity when high-humidity is present. Dust can also cause overheating and component breakdown. Dust or dirt on components surfaces acts as a thermal insulating blanket and thus prevents heat sinking, which can lead to component failure. The recommended way to remove accumulated dust is to blow it off with dry oil-free low pressure air. Any dirt that remains should be removed with a soft brush or lint free cloth dampened with a proper cleaning agent. A cotton-tipped applicator ("Q-tip") should be used to clean in narrow spaces or around components on the printed circuit boards.

CAUTION

Certain components within the power supply can be damaged by use of carbon-based solvents. Avoid use of chemicals that contain acetone, benzene tuluene, xylene, petroleum ether, kerosene, carbon tetrochloride, methylene, chloride, and trichlorotrifluoroethane (i.e., freon 113, -tf-ta-tme). Recommended agents for interior cleaning are isopropyl alcohol or kelite (1 part kelite to 30 parts water). It is safe to use ethyl alcohol and methyl alcohol if the recommended solvents are not available.

4-9. Exterior Cleaning

4-10. Dirt accumulated on the exterior of the power supply may be removed with a soft cloth or a small paint brush dampened with a mild detergent and water solution. Abrasive cleanser should never be used.

4-11. Lubrication

4-12. All adjustment potentiometers used in the Power Supply were installed with proper lubrication where necessary and will not require any additional lubrication. Thus, it is recommended that a regular periodic lubrication program not be performed on the Power Supplies. If the Power Supply is rack mounted using slide assemblies, periodic lubrication of the slide assemblies is recommended using a high temperature grease such as "Lubriplate".

4-13. Visual Inspection

4-14. Visually inspect the Power Supplies mechanical integrity for such items as loose plug-in PC Assemblies, loose or detached Cable Assemblies and modules for mechanical and thermal damage, ie. broken, bent, discolored or charred component parts.

4-15. The corrective procedure for most of the visible defects is obvious; however, particular care must be taken if thermal damage is noted. Overheating usually indicates other trouble in the module; therefore, it is important that the cause of overheating be corrected to prevent possible recurrence of thermal damage to the replaced component.

4-16. Test Equipment Required

4-17. Table 4-1 lists the test equipment required to test and calibrate the HFP Series Power Supplies.

Table 4-1. Recommended Test Equipment

Programming Source:	Maybe either the system controller or an off-line minicomputer or microcomputer with an IEEE bus port.
Programmer:	Model P-6 or P-12 with DAC cards installed.
Test Cable:	Wired as shown in Figure 4-1. The connector is specified in Table 2-1.
DVM:	5-1/2 digit or more, capable of reading from 1 μV to 200 V and calibrated to 0.01% accuracy or better on the 10 V and 200 V ranges.
Shunt:	100 A, 1 V, 0.1% or better accuracy. For calibration of units rated under 5A, a 10 A 1 V, 0.1% accurate shunt is recommended

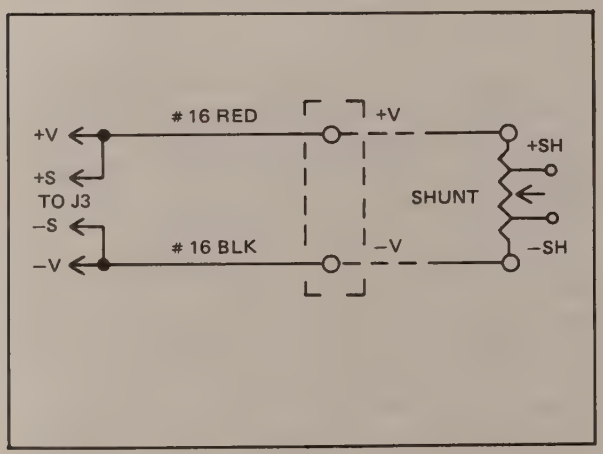


Figure 4-1. Test Cable

4-18. This procedure is for use in calibrating all members of the HFP Power Supply series. Calibration can be performed without removing the supplies from their rack adapters, it being only necessary to disconnect the normal output plug and substitute a test cable.

4-19. After initial calibration following installation in the System, the recommended interval for subsequent calibration is 6 months.

4-20. Calibration Procedure

4-21. With the output relay open, substitute the test cable for the normal output cable. Turn power ON and allow the unit to warm up for 20 minutes. Do not remove the top cover. To maintain interchangeability, the DAC board used as the input stimulus, should be in a calibrated condition. A good procedure would be to calibrate each DAC before calibrating the Supply.

4-22. V-ZERO Adjustment

1. Do not connect the shunt for this part of the procedure. Connect the DVM across the output leads using the 1 V range. Reset the channel and close the output relay. Through the top cover, adjust the V ZERO pot R9 on the A1 Control Board for a reading of 0.000 ±0.001 V.

2. If the Supply has meters, check the mechanical zero of the voltmeter and adjust if necessary.

4-23. V-CAL Adjustment

1. Connect the DVM to test points TP1 and TP2 on the A1 Assembly. Set the channel voltage to full scale. Adjust A1R1 for a reading of -10.000 ±0.001 V.

4-24. Vn CAL Adjustment

1. Connect the DVM to the + and - sense leads. Adjust A1R28 for a full rated voltage reading.

2. For a metered Supply, check the voltmeter reading. It should be within 1% of the rated voltage. If not, adjust R102 at top behind the front panel.

4-25. Open the Supplies output relay. Connect the shunt to the test cable and the DVM to the metering taps on the shunt. Check the DVM zero and adjust to less than 2 μV.

4-26. I ZERO Adjustment

1. Set the voltage to full scale, the current limit to zero and close the output. Adjust A1R15 for a reading of 0 ±1 mA. (Note: with a 0.01 ohm shunt, this is a voltage tolerance of ±10 μV.) If the higher resistance shunt (0.1 ohm) is used then adjust A1R15 for a reading of 0 ±0.1 mA (Note: with a 0.1 ohm shunt, the voltage tolerance is still ±10 μV).

2. If the Supply has meters, check the mechanical zero of the ammeter. Adjust if necessary.

4-27. I CAL Adjustment

1. Set the current limit to the Supplies rated value. Adjust A1R12 for the correct reading on the DVM (Note: for a 2 A unit with a 0.1 ohm shunt, this would be a reading of 0.2000 ±0.00001 V).

2. For a metered Supply check the ammeter reading. It should be reading within 1% of the rated current. If not adjust R103 behind the front panel at the top.

3. Open and reset the Supply. Remove the test cable and reconnect the normal output connectors. This completes the calibration of the channel.

4-28. Service Alignment Procedure

4-29. This procedure is only necessary if the HFP Supply is not meeting its load regulation specification.

4-30. All the equipment listed in Table 4-1 is needed except for the shunt. Also the DVM must have an input impedance of at least 1000 MΩ on the 10 V setting.

4-31. Follow the steps described in paragraphs 4-21, 4-22 and 4-23.

4-32. $-V_N$ BAL Adjustment

1. Using a very high impedance 10V range, connect the DVM common to TP1 and probe to TP3. It may be necessary to remove the cover to be able to easily probe TP3. With $-V_N$ on TP2 from step 4-23 set to -10.000 V, adjust R34 so that the voltage on TP3 reads $-10\ E_R/(E_R + 10)$ where E_R is the rated output voltage of the supply. Set to the nearest millivolt. On an HFP 150 this would be 9.375 V, while on an HFP 30 it would be 7.500 V.

2. Replace the cover.

4-33. Follow the steps described in paragraph 4-24. This completes the service alignment procedure.

CHAPTER 5

REPLACEABLE PARTS

5-1. INTRODUCTION

5-2. This chapter contains the parts lists for repairable assemblies in the HFP Series Power Supplies. Chapter 6 shows the assemblies where the listed parts are installed. Ordering information is included and should be used when purchasing parts from the factory. Explanation of the column listings and Table 5-1 Manufacturer's Code-To-Name Index are also included.

5-3. PART ORDERING INFORMATION

5-4. To order a part from the Replaceable Parts List, state the Systron Donner part number, indicate the quantity required and address the order to the nearest Systron Donner Sales or Service Center.

5-5. To order a part not listed in the Replaceable Parts List, state the instrument model number, instrument serial number, the description and function of the part and the number of parts required. Address the order to the nearest Systron Donner Sales or Service Center.

5-6. PARTS LISTS

5-7. The replaceable parts lists, shown in Table 5-2, are placed in top breakdown assembly order. Each column provides specific information relating to the listed parts as follows:

1. FIND: This is the find number column and lists those numbers as called out on the respective assembly drawing.

2. SD PART NUMBER: The Systron Donner part number is listed in this column.

3. DESCRIPTION: Component names and specifications are provided in this column and include value, tolerance, wattage rating, working voltage, construction, etc.

4. REFERENCE DESIGNATOR: Reference designators applicable to assemblies/schematics are listed in alpha-numeric order.

5. QUANTITY: This quantity, appearing after an item entry, indicates the number of times the component is used in that assembly.

6. MANUFACTURER'S CODE: H4-2 Federal Supply Code numbers are listed to identify component manufacturers. A Manufacturers Code-To-Name Index is provided in this chapter for cross reference.

7. MANUFACTURER'S PART NUMBER: True manufacturer part numbers are listed in this column.

Table 5-1. Manufacturer's Code-To-Name Index

Mfr. Code	Manufacturer Name	Address	Zip Code
01121	Allen Bradley Co.	Milwaukee, WI	53203
01295	Texas Instruments Inc. Semiconductor and Components Div.	Dallas, TX	75265
02660	Bunker Ramo Corp. Amphenol Div.	Broadview, IL	60153
03508	General Electric Co. Semiconductor Products Div.	Auburn, NY	13021

Table 5-1. Manufacturer's Code-To-Name Index — Continued

Mfr. Code	Manufacturer Name	Address	Zip Code
04222	AVX Ceramics Div.-AVX Corp.	Myrtle Beach, SC	29577
04713	Motorola Semiconductors Prod. Div.	Phoenix, AZ	85008
05574	Viking Connectors Inc.	Chatsworth, CA	91311
06383	Panduit Corp.	Tinley Park, IL	60477
06540	Mite Corp. Amatom Electronic Hardware Div.	New Haven, CT	06515
08289	Delbert Blinn Co. Inc.	Pomona, CA	91769
08547	R.G. Wallace Co. Inc.	Compton, CA	90220
09353	C and K Components Inc.	Newton, MA	02158
09922	Burndy Corp.	Norwalk, CT	06856
11237	CTS Keene Inc.	Paso Robles, CA	93446
13913	Western Reserve Electronics Inc.	Twinsburg, OH	44087
14726	Midland-Ross Corp, Cambion Div	Pompano Beach, FL	33060
15513	Data Display Products	Los Angeles, CA	90045
15636	Elec-Trol Inc.	Saugus, CA	91350
18324	Signetics Corp.	Sunnyvale, CA	94086
20932	Illinois Tool Works Inc. Emcom Div.	San Diego, CA	92121
24335	Cooper Laboratories Inc.	Wayne, NJ	07470
26066	Minnesota Mining and Mfg. Co. Industrial Tape Division	St. Paul, MN	55101
27014	National Semiconductors Corp.	Santa Clara, CA	95051
27264	Molex Inc.	Lisle, IL	60532
28480	Hewlett-Packard Co.	Palo Alto, CA	94304
28520	Heyman Mfg. Co.	Kenilworth, NJ	07033
30146	Symbex Corp. Subsidiary Asso. Enterprises	Painesville, OH	44077
34649	Intel Corp.	Santa Clara, CA	95051
52542	Systron Donner Corp. Instrument Div.	Concord, CA	94518
53387	Minnesota Mining and Mfg. Co. Electronic Products Division	St.Paul, MN	55101
54453	Sullins Electronic Corp.	San Marcos, CA	92069
55210	Gettig Engineering and Mfr.	Spring Mill, PA	16875
56289	Sprague Electric Co.	North Adams, MA	01247
70903	Belden Corp.	Geneva, IL	60134
71279	Midland-Ross Corp. Cambridge Division	Cambridge, MA	02140
71468	ITT Cannon	Fountain Valley, CA	92708
73138	Beckman Instruments Inc. Helipot Div.	Fullerton, CA	92634
73803	Texas Instruments Inc.	Attleboro, MA	02703
74840	Illinois Capacitor Inc.	Lincolnwood, IL	60645
75378	CTS Knights Inc.	Sandwich, IL	60548
75915	Tracor Littlefuse Inc.	Des Plaines, IL	60016
76381	Minnesota Mining and Mfg. Co.	St. Paul, MN	55101
78189	Illinois Tool Works Inc. Shakeproof Div.	Elgin, IL	60120
78553	Tinnerman Products Inc.	Cleveland, OH	44129
79963	Zierick Mfg. Co.	Mount Kisco, NY	10549
80205	National Aerospace Standard		

Table 5-1. Manufacturer's Code-To-Name Index — Continued

Mfr. Code	Manufacturer Name	Address	Zip Code
81349	MIL Specifications		
82389	Switchcraft Inc.	Chicago, IL	60630
82647	Texas Instruments Inc. Control Products Div.	Attleboro, MA	02703
86928	Seastrom Mfg. Co. Inc.	Glendale, CA	91201
88245	Litton Systems Inc. USECO Div.	Van Nuys, CA	91409
91506	Augat Inc.	Attleboro, MA	02703
91637	Dale Electronics Inc.	Columbus, NE	68601
91833	Keystone Electronics Corp.	New York, NY	10012
94222	Southco Inc.	Lester, PA	19113
95987	Weckesser Co. Inc.	Chicago, IL	60641
96733	San Fernando Electric Mfg. Co.	San Fernando, CA	91341
96906	MIL Specifications		
98159	Rubber Teck Inc.	Gardena, CA	90247
98921	O and M Mfg. Co.	Houston, TX	77029
99392	S T M Corp.	Oakland, CA	94601

Table 5-2. Replaceable Parts Lists

Assembly	Model	Assy No.	Page
Shipping	HFP 30-15	079251	5-7
Shipping	HFP 150-3	079248	5-7
Shipping, Opt. 11, 30, 31	HFP 150-2	07924801	5-7
Test	HFP 30-15	07923701	5-9
Test	HFP 150-3	07923703	5-10
Test	HFP 150-2	07923702	5-11
Control PCB	HFP 30-15	06582924	5-13
Control PCB	HFP 150-3	06582927	5-17
Control PCB	HFP 150-2	06582923	5-21
Series Pass PCB Left	HFP 30-15	07923601	5-25
Series Pass PCB Right	HFP 30-15	07923602	5-25
Series Pass PCB Left	HFP 150-3	07923605	5-26
Series Pass PCB Right	HFP 150-3	07923606	5-26
Series Pass PCB Left	HFP 150-2	07923604	5-27
Series Pass PCB Right	HFP 150-2	07923603	5-27
Switch Control PCB	HFP 30-15	07923501	5-29
Switch Control PCB	HFP 150	07923502	5-30
Left Heatsink	HFP 30-15	07924903	5-31
Right Heatsink	HFP 30-15	07924904	5-31
Left Heatsink	HFP 150-3	07924905	5-32
Right Heatsink	HFP 150-3	07924906	5-32
Left Heatsink	HFP 150-2	07924902	5-33
Right Heatsink	HFP 150-2	07924901	5-33
Heatsink Support	HFP 30-15	07923901	5-35
Heatsink Support	HFP 150	07923902	5-36
Final (Top) Heatsink	HFP 30-15	07926301	5-37
Final (Top) Heatsink	HFP 150-3	07926303	5-37
Final (Top) Heatsink	HFP 150-2	07926302	5-38
Transformer	HFP 30-15	07926201	5-39
Transformer	HFP 150	07926202	5-39
Rear Panel	HFP 30-15	07927801	5-41
Rear Panel	HFP 150-3	07924102	5-41
Rear Panel	HFP 150-2	07924101	5-42
Shipping Kit	HFP Series	079269	5-43

Table 5-2. Replaceable Parts Lists — Continued

Assembly	Model	Assy No.	Page
Line Voltage Feature (01)	HFP Series	079270	5-45
115V Option 01	HFP Series	07919001	5-45
208V Option 11	HFP Series	07919003	5-45
220V Option 12	HFP Series	07919004	5-46
230V Option 13	HFP Series	07919005	5-46
240V Option 14	HFP Series	07919006	5-46
Metering Feature (02)	HFP 30-15	07919106	5-47
Metering Feature (02)	HFP 150-3	07919107	5-47
No Meters, Option 01	HFP Series	07913002	5-47
Meters, Option 30	HFP 30-15	07912906	5-48
Meters, Option 30	HFP 150-3	07912908	5-48
Meters, Option 30	HFP 150-2	07912907	5-49
Output Switching Feature (03)	HFP 30-15	079271	5-51
Output Switching Feature (03)	HFP 150-3	079272	5-51
Single Polarity, Opt. 01	HFP 30-15	07927101	5-52
Single Polarity, Opt. 01	HFP 150-3	07927201	5-52
Dual Polarity, Opt. 31	HFP 30-15	07927102	5-53
Dual Polarity, Opt. 31	HFP 150	07927202	5-53
Direct Output, Opt. 34	HFP 30-15	07930201	5-54
Direct Output, Opt. 34	HFP 150-3	07926702	5-54
Indicator PCB	HFP Series	07919301	5-55
Meter PCB	HFP Series	06578405	5-55
Relay Card, Single Polarity	HFP 30-15	07904005	5-57
Relay Card, Dual Polarity	HFP 30-15	07904006	5-58
Relay Card, Single Polarity	HFP 150-3	07904001	5-59
Relay Card, Dual Polarity	HFP 150	07904002	5-60
Single Relay Bracket	HFP 30-15	07929301	5-61
Dual Relay Bracket	HFP 30-15	07929302	5-61

E HFP30-15 POWER SUPPLY 11/21/86 079251 A-----A 2/11/86

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	07923701	ASSY TEST HFP30-15		1.000	52542	
0002	PHANTOM 079269	KIT SHPG HFP SERIES		1.000	52542	
0003	FEATURE 079270	FEATURE 01 LINE VOLT HFP		1.000	52542	
0004	FEATURE 07919106	FEATURE 02 METERING HFP 30		1.000	52542	
0005	FEATURE 079271	FEATURE 3 O/P SWITCHING HFP30-		1.000	52542	
0013	123540	CONN CIRC 7 PIN #2 ST PLUG		1.000	96906	MS3106A20-15P
0014	0079251	OUTLINE DWG HFP-SERIES	REF	.000	52542	
0015	07905520	FOILCAL HFP30-15		1.000	52542	
0016	079251TAB	DWG ASSY SHIPPING HFP	REF	.000	52542	
0017	707925101	SCHEMATIC BASIC HFP3-015	REF	.000	52542	

HFP150-3 POWER SUPPLY 11/24/86 07924B A-----A 2/11/86

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	07923703	ASSY TEST HFP150-3		1.000	52542	
0002	PHANTOM 079269	KIT SHPG HFP SERIES		1.000	52542	
0003	FEATURE 079270	FEATURE 01 LINE VOLT HFP		1.000	52542	
0004	FEATURE 07919107	FEATURE 02 METERING HFP150-3		1.000	52542	
0005	FEATURE 079272	FEATURE 03 OUTPUT SWITCHING		1.000	52542	
0013	11769703	CONN CIRC 5 PIN PLUG Y-KEY		1.000	71468	KPT06B-14-5P-Y
0014	0079251	OUTLINE DWG HFP-SERIES	REF	.000	52542	
0015	07905521	FOILCAL HFP150-3		1.000	52542	
0016	079248TAB	DWG ASSY SHIPPING HFP	REF	.000	52542	
0017	707924802	SCHEM HFP150-3	REF	.000	52542	

HFP150-2 W/OPT 11,30,31 11/21/86 07924801 A-----A 2/01/86

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	PHANTOM 079269	KIT SHPG HFP SERIES		1.000	52542	
0002	07923702	ASSY TEST HFP150-2		1.000	52542	
0003	07919003	OPT 11 50-60HZ/208VAC		1.000	52542	
0004	07912907	ASSY PNL FRONT W/MTRS HFP150-2		1.000	52542	
0005	07927202	ASSY OPT 31 POL DUAL HFP 150		1.000	52542	
0013	11769703	CONN CIRC 5 PIN PLUG Y-KEY		1.000	71468	KPT06B-14-5P-Y
0014	0079251	OUTLINE DWG HFP-SERIES	REF	.000	52542	
0015	07905517	FOILCAL HFP150-2		1.000	52542	
0016	079248TAB	DWG ASSY SHIPPING HFP	REF	.000	52542	
0017	707924801	SCHEM BASIC HFP150-2	REF	.000	52542	

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	079237	FAB CHASSIS HFP		1.000	52542	
0002	840192	FEET RUBBER #2095	REF	.000	52542	
0003	PHANTOM 5079280	WIRE LIST LOOSE HFP		1.000	52542	
0004	PHANTOM 07926201	ASSY XFORMER TI HFP30-15	T1	1.000	52542	
0005	123597	CAP EL CAN 70000UF 30V 3D*4.13		2.000	52542	
0006	630284	RES WW PWR300 3W 3% <30PPM/C<.		2.000	15915	TS2C
0007	123068	CLAMP CAP 3ID 2HOLE MT6		2.000	00853	115058-01
0008	07926301	ASSY HEATSINK TOP HFP30-15		1.000	52542	
0009	07927801	ASSY PANEL REAR HFP30-15		1.000	52542	
0010	079295	FAB BUS BAR HFP		1.000	52542	
0011	123085	FLAT WSHR #10 .50D .048T CDPS		4.000	86928	5702-234-48-C2
0012	100939	NUT KEP 10-32 .4060D .16TKK		4.000	78189	511-101800-50
0013	100862	NUT KEP 6-32 .344OD .14 THK CP		8.000	78189	511-061800-00
0014	100662	FLAT WSHR 6 .146 ID.270 OD CR		10.000	86928	5710-23-10
0015	10063208	PHMS CRES 6-32 * 1/2		2.000	96906	MS51957-30
0016	079243	FAB BRKT RELAY PCB HFP		1.000	52542	
0017	10063206	PHMS CRES 6-32 * 3/8		3.000	96906	MS51957-28
0018	100647	INT TOOTH #6 CRES		5.000	96906	MS35333-71
0019	100681	SPCR THRDD6-32 3/4L X 1/4 HEX		1.000	06540	8218-B-0632-3A
0020	12369606	PHMS CRES 1/4-28X3/8 PHILLIPS	REF	.000	96906	MS51958-77
0021	102905	LUG SOLDER 1/4 INT TOOTH .81L		4.000	83330	1468
0022	100704	FLAT WSHR 6 .156 ID.312 OD CR		2.000	96906	MS15795-805
0023	10063210	PHMS CRES 6-32 * 5/8		2.000	96906	MS51957-31
0024	10064208	PHMS CRES 8-32 X 1/2	REF	.000	96906	MS51957-45
0025	10062604	PHMS CRES 4-40 X 1/4		2.000	96906	MS51957-13
0026	100794	INT TOOTH #4 CRES		2.000	96906	MS35333-70
0027	06582924	ASSY PCB CONTROL HFP30-15	A1	1.000	52542	

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	079237	FAB CHASSIS HFP		1.000	52542	
0001	123085	FLAT WSHR #10 .50D .048T CDPS		4.000	86928	5702-234-48-C2
0002	840192	FEET RUBBER #2095	REF	.000	52542	
0003	PHANTOM 5079268	WIRE LIST LOOSE HFP		1.000	52542	
0004	PHANTOM 07926202	ASSY XFORMER HFP150-3		1.000	52542	
0005	820203	CAP EL CAN 4000UF 180V	C,4	2.000	52542	820203
0006	640549	RES WW PWR4.0K 5W 5%(1.1L.38D.	R1,2	2.000	24681	VL5-44000
0007	123068	CLAMP CAP 3ID 2HOLE MTG		2.000	00853	115058-01
0008	07926303	ASSY HEATSINK TOP HFP150-3		1.000	52542	
0009	07924102	ASSY PANEL REAR HFP150-3		1.000	52542	
0010	079292	FAB BUS BAR HFP		1.000	52542	
0012	100939	NUT KEP 10-32 .4060D .16TKK		4.000	78189	511-101800-50
0013	100862	NUT KEP 6-32 .344OD .14 THK CP		8.000	78189	511-061800-00
0014	100662	FLAT WSHR 6 .146 ID.270 OD CR		10.000	86928	5710-23-10
0015	10063208	PHMS CRES 6-32 * 1/2		2.000	96906	MS51957-30
0016	079243	FAB BRKT RELAY PCB HFP		1.000	52542	
0017	10063206	PHMS CRES 6-32 * 3/8		3.000	96906	MS51957-28
0018	100647	INT TOOTH #6 CRES		5.000	96906	MS35333-71
0019	100681	SPCR THRDD6-32 3/4L X 1/4 HEX		1.000	06540	B218-B-0632-3A
0020	10064406	PHMS CRES 10-32 X 3/8		4.000	96906	MS51958-61
0021	100989	LUG SOLDER #10INT TOOTH.69L2		4.000	78189	2104-10-00
0022	10073104	FHMS CRES 6-32 * 1/4		7.000	96906	MS24693-C24
0023	10075804	FHMS CRES 10-32X1/4		2.000	96906	MS24693-C268
0024	10064208	PHMS CRES 8-32 X 1/2	REF	.000	96906	MS51957-45
0025	10062604	PHMS CRES 4-40 * 1/4		2.000	96906	MS51957-13
0026	100794	INT TOOTH #4 CRES		2.000	96906	MS35333-70
0027	06582927	ASSY PCB CONTROL HFP150-3		1.000	52542	
0028	10063210	PHMS CRES 6-32 * 5/8		2.000	96906	MS51957-31
0029	079237TAB	DWG ASSY TEST HFP	REF	.000	52542	

SINGLE LEVEL EXPLOSION

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	079237	FAB CHASSIS HFP		1.000	52542	
0002	840192	FEET RUBBER #2095	REF	.000	52542	
0003	PHANTOM 5079268	WIRE LIST LOOSE HFP		1.000	52542	
0004	PHANTOM 07926202	ASSY XFORMER HFP150-3	T1	1.000	52542	
0005	820203	CAP EL CAN 4000UF 180V	C3,4	2.000	52542	820203
0006	640549	RES WW PWR4.0K 5W 5%X1.1L.38D.	R1,2	2.000	24681	VL5-44000
0007	123068	CLAMP CAP 3ID 2HOLE MTG		2.000	00853	115058-01
0008	07926302	ASSY HEATSINK TOP HFP150-2		1.000	52542	
0009	07924101	ASSY PANEL REAR HFP150-2		1.000	52542	
0010	079292	FAB BUS BAR HFP		1.000	52542	
0011	123085	FLAT WSHR #10 .50D .048T CDPS		4.000	86928	5702-234-48-02
0012	100939	NUT KEP 10-32 .4060D .16TKK		4.000	78189	511-101800-50
0013	100862	NUT KEP 6-32 .3440D .14 THK CP		8.000	78189	511-061800-00
0014	100662	FLAT WSHR 6 .146 ID.270 OD CR		10.000	86928	5710-23-10
0015	10063208	PHMS CRES 6-32 * 1/2		2.000	96906	MS51957-30
0016	079243	FAB BRKT RELAY PCB HFP		1.000	52542	
0017	10063206	PHMS CRES 6-32 * 3/8		3.000	96906	MS51957-28
0018	100647	INT TOOTH #6 CRES		5.000	96906	MS35333-71
0019	100681	SPCR THRDD6-32 3/4L X 1/4 HEX		1.000	06540	8218-B-0632-3A
0020	10064406	PHMS CRES 10-32 X 3/8		4.000	96906	MS51958-61
0021	100989	LUG SOLDER #10INT TOOTH.69L2		4.000	78189	2104-10-00
0022	10073104	PHMS CRES 6-32X1/4		7.000	96906	MS24693-C24
0023	10075804	PHMS CRES 10-32X1/4		2.000	96906	MS24693-C268
0024	10064208	PHMS CRES 8-32 X 1/2	REF	.000	96906	MS51957-45
0025	10062604	PHMS CRES 4-40 X 1/4		2.000	96906	MS51957-13
0026	100794	INT TOOTH #4 CRES		2.000	96906	MS35333-70
0027	06532923	ASSY PCB CONTROL HFP150-2	A1	1.000	52542	

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	065829	FAB PCB CONTROL		1.000	52542	
0002	065829TAB	ASSY PCB CONTROL HRP/QFP	REF	.000	52542	
0003	B40420	XSTR MT PDTO-5 .355OD .038THK		3.000	07047	10079 DAP
0004	100492	SPCR SWAGE4-40 .125L X.25RND .		2.000	71279	1300-9
0005	11981301	CAP EL AX 1000UF 35V -10+50%	C1	1.000	74840	108TTA035A
0006	11982401	CAP EL AX 220UF 35V -20/75% <.	C2	1.000	74840	227TTA035A
0007	100211	CAP TANT 15UF 20V 10%	C3	1.000	56289	150D156X9020B2
0008	100176	CAP CER DP 1UF 50V 20% Z5U .38	C4,5,10	3.000	56289	2C37Z5U105M050B
0010	102879	JUMPER, 22AWG INSULATED .09D	CR11,32	4.000	55210	L-2007-1
0010	99REF50	*** REF DESN'TORS NOT USED ***	C6	.000		
0011	117621	CAP CER DP 10PF 100V 5% C0G	C7	1.000	96773	DB44BY100J
0012	100168	CAP MYLAR .01UF 200V 10%	C8,9	2.000	56289	192P10392
0015	11979801	CAP CER DP .033UF 50V 10% X7R	C11	1.000	71590	CW20C333K
0016	11979701	CAP CER DP .022UF 50V 10% X7R	C12	1.000	71590	CW20C223K
0017	117636	CAP CER DP330PF 100V 5% C0G .1	C13	1.000	96733	DB45BY331J
0018	117640	CAP CER DP 27PF 100V 5% C0G .1	C14	1.000	96733	DB44BY270J
0019	99REF50	*** REF DESN'TORS NOT USED ***	C15	.000		
0020	116501	CAP CER DP2200PF 100V 10% X7R	C16	1.000	96733	DB44BX222K
0021	117637	CAP CER DP470PF 100V 5% C0G .1	C17	1.000	96733	DB45BY471J
0022	117359	CAP CER DP 47PF 100V 5% C0G .1	C18	1.000	96733	DB44BY470J
0023	100178	CAP CER DP .1UF 50V 20% Z5U .2	C19,24	3.000	56289	2C37Z5U104M050B
0023	99REF01	*** REF DESIG CONT FROM ABOVE	C25	.000		
0024	99REF50	*** REF DESN'TORS NOT USED ***	C20-23	.000		
0030	11982501	DIODE RECT BRDG MDA101 100V 1A	CR1	1.000	04713	MDA101A
0031	99REF50	*** REF DESN'TORS NOT USED ***	CR2	.000		
0032	100426	DIODE SBNL1N459A 175V	CR3	1.000	13715	1N459A
0033	100383	DIODE ZENR 15V 5% .4W 1N965B	CR4	1.000	04713	1N965B
0034	100385	DIODE SIG 1N4151 50V	CR5,6,8	23.000	03508	1N4151
0034	99REF01	*** REF DESIG CONT FROM ABOVE	9,12-30	.000		
0036	100416	DIODE ZENR6.8V 5% .4W 1N957B	CR7	1.000	04713	1N957B
0037	100395	DIODE ZENR 10V 5% .4W 1N961B	CR10	1.000	04713	1N961B
0040	102879	JUMPER, 22AWG INSULATED .09D	CR11,32	4.000	55210	L-2007-1
0040	99REF01	*** REF DESIG CONT FROM ABOVE	CR33,35	.000		
0060	100390	DIODE ZENR 12V 5% .4W 1N963B	CR31	1.000	04713	1N963B
0062	100404	DIODE ZENR 18V 5% .4W 1N967B	CR34	1.000	04713	1N967B
0064	123100	DIODE REF 1.23V 2% LM385Z-1.2	CR36,37	2.000	27014	LM385Z-1.2
0065	11933801	SOCKET IC 24 PIN DIP PC MTG HI	J1	1.000	06776	ICT-248-S-TG
0066	11973201	CON PC 12 PIN RTANG HDR .1C-C	J2	1.000	27264	22-12-2124
0067	11981001	CON PC 8 PIN RTANG HDR .1C-C F	J3	1.000	27264	22-12-2084
0069	101376	XSTR SI NPN 2N2219	Q1	1.000	07263	2N2219
0070	700179	XSTR SIPNPMPS-A92 300V	Q2	1.000	04713	MPS-A92
0071	705067	XSTR SIPNP 2N2905A 60V 100B300	Q3,4	2.000		2N2905AS
0073	101378	XSTR SI PNP 2N3906 40V 100B300	Q5	1.000	04713	2N3906
0074	101377	XSTR SI NPN 2N3904 40V 100B300	Q6	1.000	04713	2N3904
0075	102183	POT 15T PC500 10% 3/8W CERM E	R1	1.000	73138	89PR500
0076	119007	RES MF 4.87K .1W 1% 25PPM/C	R2,3	2.000	91637	CMF-55 T9
0078	119041	RES MF 10.0K .1W 1% 25PPM/C	R4,14	2.000	91637	CMF-55 T9

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0079	117576	RES MF 4.99K .1 W 1% 100PPM	R5	1.000		C=RN55D4991F
0080	101564	RES CC1/4W 10M 5%	R6	1.000	01121	CB1065
0081	101559	RES CC1/4W 3.3K 5%	R7	1.000	01121	CB3325
0082	106002	RES CC1/4W2.4M 5%	R8	1.000	01121	CB2455
0083	102470	POT 15T PC 20K 10% 3/8W CERM E	R9	1.000	73138	89PR20K
0085	99REF50	*** REF DESN'TORS NOT USED ***	R11	.000		
0086	102154	POT 15T PC 20 20% 3/8W CERM E	R12	1.000	73138	89PR20
0087	103018	RES MF 255 .12W 1% 25PP	R13	1.000	91637	MFF 1/8 T9
0089	102472	POT 15T PC 10K 10% 3/8W CERM E	R15	1.000	73138	89PR10K
0090	101569	RES CC 1/4W 1.0K 5%	R10,16,	5.000	01121	CB1025
0090	99REF01	*** REF DESIG CONT FROM ABOVE	20,23,57	.000		
0091	101608	RES CC1/4W 6.2K 5%	R17	1.000	01121	CB6225
0092	101572	RES CC1/4W 22K 5%	R18	1.000	01121	CB2235
0093	101537	RES CC1/4W300 OHMS 5%	R19	1.000	01121	CB3015
0095	101887	RES CC1/4W7.5 OHMS 5%	R21	1.000	01121	CB7565
0096	101570	RES CC1/4W 10K 5%	R22,24	5.000	01121	CB1035
0096	99REF01	*** REF DESIG CONT FROM ABOVE	38,68,70	.000		
0099	101625	RES CC1/4W470 OHMS 5%	R25	1.000	01121	CB4715
0100	119087	RES MF 27.4K .1W 1% 25PPM/C	R26	1.000	91637	CMF-55 T9
0101	118844	RES MF 10.0K .1W .1% 5PPM/C	R27	1.000	60393	PR1/10 10K.1%T5
0102	102119	POT 15T PC 2K 10% 3/8W CERM E	R28,34	2.000	73138	89PR2K
0103	119091	RES MF 29.4K .1W 1% 2	R29	1.000	91637	CMF-55 T9
0104	119140	RES MF 88.7K .1W 1% 25PPM/C	R30	1.000	91637	CMF-55 T9
0105	630420	RES WW PWR1.5K 3W 3% <20PPM/C	R31,69	2.000	15915	T52C
0107	99REF50	*** REF DESN'TORS NOT USED ***	R32,33	.000		
0108	99REF50	*** REF DESN'TORS NOT USED ***	R35	.000		
0110	106363	RES MF 10.0K .12W .1% 50PPM	R36	1.000	14298	EE-1/8 RN60C
0111	11980401	RES MF 11.0K .1W .1% 50PPM/C	R37	1.000		C=RN55C1102B
0113	101577	RES CC1/4W 1.5K 5%	R39	1.000	01121	CB1525
0114	101567	RES CC1/4W 820 OHM 5%	R40	1.000	01121	CB8215
0115	119091	RES MF 29.4K .1W 1% 2	R41	1.000	91637	CMF-55 T9
0116	117818	RES MF 4990HMS.1 W 1% 100 PPM	R42	1.000		C=RN55D4990F
0117	101552	RES CC1/4W 15K 5%	R43	1.000	01121	CB1535
0118	101549	RES CC1/4W 30K 5%	R44,45	2.000	01121	CB3035
0120	101554	RES CC1/4W 24K 5%	R46-48	3.000	01121	CB2435
0120	99REF01	*** REF DESIG CONT FROM ABOVE	R60,61	.000		
0123	101576	RES CC1/4W 33K 5%	R49,50	3.000	01121	CB3335
0123	99REF01	*** REF DESIG CONT FROM ABOVE	R62	.000		
0125	101589	RES CC1/4W 1.1K 5%	R51-53	3.000	01121	CB1125
0126	101581	RES CC1/4W 1.2K 5%	R54,63	2.000	01121	CB1225
0129	99REF50	*** REF DESN'TORS NOT USED ***	R55.56	.000		
0132	99REF50	*** REF DESN'TORS NOT USED ***	R58,59	.000		
0137	101609	RES CC 1/4W 100 OHM 5%	R64	1.000	01121	CB1015
0138	101498	RES CC 1/2W 100 OHM 5%	R65	1.000	01121	EB1015
0139	101755	RES CC1/4W430K 5%	R66	1.000	01121	CB4345
0140	101684	RES CC1/4W1.2M 5%	R67	1.000	01121	CB1255
0141	100521	TEST POINTBROWN PC MT PARALLE	TP1	1.000	91506	8041-183

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0142	100522	TEST POINTRED PC MT PARALLE	TP2	1.000	91506	B041-1B4
0143	123103	TERM SWAGE TUB HD.062MAT.37HI.	TP3	1.000	91833	1540-2
0144	025758	IC OP AMP LM201A A94DB IB75NA	U1	1.000	27014	LM201AH
0145	11982801	IC OP AMP LF412 JFET DUAL A>88	U2	1.000	27014	LF412CH
0146	11763801	IC OP AMP AD542JH JFET A100DB	U3	1.000	24335	AD542JH
0147	11982701	IC OP AMP LF411 JFET A>88DB IB	U4	1.000	27014	LF411CH
0148	102858	OPTOISOLTR CT6 DUAL IC/IF	U5,6	2.000	50522	MCT6
0150	103039	IC VOLTREG7815 15V 5%,1A,15W-.	U7	1.000	04713	MC7815CT
0151	11980701	IC VOLTREG MC7906CT -6V 5% 1A	U8	1.000	04713	MC7906CT
0152	117261	IC VOLTREG79L15 -15.6/14.4V .0	U9	1.000	04713	MC79L15ACP
0153	99REF50	*** REF DESN'TORS NOT USED ***	U10	.000		
0154	11980901	IC CMOS 14584 HEX SCHMITT TRIG	U11	1.000	04713	MC14584BCP
0155	103217	IC CMOS 4049 HEX INV BUFF LT	U12	1.000	02735	MC14049BCP
0156	106621	IC OP AMP 741C A86DB IB.5VA 8D	U13	1.000	07263	741TC
0158	102879	JUMPER, 22AWG INSULATED .09D	W1,2,6	3.000	55210	L-2007-1
0159	99REF50	*** REF DESN'TORS NOT USED ***	W3-5	.000		
0160	99REF50	*** REF DESN'TORS NOT USED ***	W7-12	.000		
0165	10062604	PHMS CRES 4-40 X 1/4		2.000	96906	MS51957-13
0166	100794	INT TOOTH #4 CRES		2.000	96906	MS35333-70
0170	707925101	SCHEMATIC BASIC HFP3-015	REF	.000	52542	

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	065829	FAB PCB CONTROL		1.000	52542	
0002	065829TAB	ASSY PCB CONTROL HRP/QFP	REF	.000	52542	
0003	840420	XSTR MT PDTO-5 .355OD .038THK		2.000	07047	10079 DAP
0004	100492	SPCR SWAGE4-40 .125L X.25RND .		2.000	71279	1300-9
0005	11981301	CAP EL AX 1000UF 35V -10+50%	C1	1.000	74840	108TTA035A
0006	11982401	CAP EL AX 220UF 35V -20/75% <.	C2	1.000	74840	227TTA035A
0007	100211	CAP TANT 15UF 20V 10%	C3	1.000	56289	150D156X9020B2
0008	100176	CAP CER DP 1UF 50V 20% Z5U .38	C4,5,10	3.000	56289	2C37Z5U105M050B
0011	117621	CAP CER DP 10PF 100V 5% C0G	C7	1.000	96773	DB44BY100J
0012	117570	CAP CER DP .01 UF 100V 20% X7R	C8,9	2.000	04222	SR201C103MAA
0015	11979801	CAP CER DP .033UF 50V 10% X7R	C11	1.000	71590	CW20C333K
0016	11979701	CAP CER DP .022UF 50V 10% X7R	C12	1.000	71590	CW20C223K
0017	117636	CAP CER DP330PF 100V 5% C0G .1	C13	1.000	96733	DB45BY331J
0018	117640	CAP CER DP 27PF 100V 5% C0G .1	C14	1.000	96733	DB44BY270J
0019	99REF50	*** REF DESN'TORS NOT USED ***	C15	.000		
0020	117569	CAP CER DP4700PF 100V 20% X7R	C16	1.000	04222	3418100C472M
0021	116501	CAP CER DP2200PF 100V 10% X7R	C17	1.000	96733	DB44BX222K
0022	99REF86	WIRE JUMPER	C18	.000	52542	
0023	100178	CAP CER DP .1UF 50V 20% Z5U .3	C19,24	3.000	56289	2C37Z5U104M050B
0023	99REF01	*** REF DESIG CONT FROM ABOVE	C25	.000		
0024	99REF50	*** REF DESN'TORS NOT USED ***	C20-23	.000		
0025	11990701	CAP CER DP .015UF 10% X7R	C27	1.000	71570	CW15C153K
0030	11982501	DIODE RECT BRDG MDA101 100V 1A	CR1	1.000	04713	MDA101A
0031	100426	DIODE SGNL1N459A 175V	CR3	1.000	13715	1N459A
0032	100383	DIODE ZENR 15V 5% .4W 1N965B	CR4	1.000	04713	1N965B
0033	100385	DIODE SIG 1N4151 50V	CR5,6	2.000	03508	1N4151
0034	100385	DIODE SIG 1N4151 50V	CR8,9	19.000	03508	1N4151
0034	99REF01	*** REF DESIG CONT FROM ABOVE	CR12-17,	.000		
0034	99REF02	*** REF DESIG CONT FROM ABOVE	CR20-30	.000		
0036	100416	DIODE ZENR6.8V 5% .4W 1N957B	CR7	1.000	04713	1N957B
0039	100395	DIODE ZENR 10V 5% .4W 1N961B	CR10	1.000	04713	1N961B
0040	102879	JUMPER, 22AWG INSULATED .09D	CR11,18,	4.000	55210	L-2007-1
0040	99REF01	*** REF DESIG CONT FROM ABOVE	CR32,33	.000		
0060	100390	DIODE ZENR 12V 5% .4W 1N963B	CR31	1.000	04713	1N963B
0063	100404	DIODE ZENR 18V 5% .4W 1N967B	CR34	1.000	04713	1N967B
0064	725019	DIODE ZENRIN5241B 11V 5% .5W75	CR35	1.000	07910	1N5241B
0065	123100	DIODE REF 1.23V 2% LM385Z-1.2	CR36,37	2.000	27014	LM385Z-1.2
0066	11933801	SOCKET IC 24 PIN DIP PC MTG HI	J1	1.000	06776	ICT-246-S-TG
0067	11973201	CON PC 12 PIN RTANG HDR .1C-C	J2	1.000	27264	22-12-2124
0068	11981001	CON PC 8 PIN RTANG HDR .1C-C F	J3	1.000	27264	22-12-2084
0069	101376	XSTR SI NPN 2N2219	Q1	1.000	07263	2N2219
0070	700179	XSTR SIPNPMPS-A92 300V	Q2,3	2.000	04713	MPS-A92
0072	119945	XSTR SIPNP MM4003 250V 20BMIN	Q4	1.000	04713	MM4003
0073	101378	XSTR SI PNP 2N3906 40V 100B300	Q5	1.000	04713	2N3906
0074	101377	XSTR SI NPN 2N3904 40V 100B300	Q6	1.000	04713	2N3904
0075	102183	POT 15T PC500 10% 3/8W CERM E	R1	1.000	73138	89PR500
0076	119007	RES MF 4.87K .1W 1% 25PPM/C	R2,3	2.000	91637	CMF-55 T9

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0078	119041	RES MF 10.0K .1W 1% 25PPM/C	R4,14	2.000	91637	CMF-55 T9
0079	117576	RES MF 4.99K .1 W 1% 100PPM	R5	1.000		C=RN55D4991F
0080	101564	RES CC1/4W 10M 5%	R6	1.000	01121	CB1065
0081	101559	RES CC1/4W 3.3K 5%	R7	1.000	01121	CB3325
0082	106002	RES CC1/4W2.4M 5%	R8	1.000	01121	CB2455
0083	102470	POT 15T PC 20K 10% 3/8W CERM E	R9	1.000	73138	89PR20K
0084	101569	RES CC 1/4W 1.0K 5%	R10	1.000	01121	CB1025
0086	102154	POT 15T PC 20 20% 3/8W CERM E	R12	1.000	73138	89PR20
0087	11775801	RES MF 150 .1W 1% 25PPM	R13	1.000		C=RN55E1500F
0089	102472	POT 15T PC 10K 10% 3/8W CERM E	R15	1.000	73138	89PR10K
0090	10156901	RES CC1/4W1.0K 5% .4LS	R16,20	4.000	01121	CB1025
0090	99REF01	*** REF DESIG CONT FROM ABOVE	R23,57	.000		
0091	101608	RES CC1/4W 6.2K 5%	R17,CR19	2.000	01121	CB6225
0092	101572	RES CC1/4W 22K 5%	R18	1.000	01121	CB2235
0093	101537	RES CC1/4W300 OHMS 5%	R19	1.000	01121	CB3015
0095	101887	RES CC1/4W7.5 OHMS 5%	R21	1.000	01121	CB7565
0096	101570	RES CC1/4W 10K 5%	R22,24	5.000	01121	CB1035
0096	99REF01	*** REF DESIG CONT FROM ABOVE	38,68,70	.000		
0099	101577	RES CC1/4W 1.5K 5%	R25	1.000	01121	CB1525
0100	11949701	RES MF 137K .1W 1% <50PPM/C <.	R26	1.000		RN55C1373F
0101	118844	RES MF 10.0K .1W .1% 5PPM/C	R27	1.000	60393	PR1/10 10K.1%T5
0102	102473	POT 15T PC 5K 10% 3/8W CERM E	R28,34	2.000	73138	89PR5K
0103	119147	RES MF 102K .1W 1% 25PPM/C	R29	1.000	91637	CMF-55 T9
0104	106201	RES MF 787K .12W 1% 50PPM	R30,31	2.000		RN60C7873F
0106	630500	RES WW PWR7.5K 3W 3%<30PPM<.63	R32	1.000	15915	TS2C
0107	99REF50	*** REF DESN'TORS NOT USED ***	R33	.000		
0109	99REF50	*** REF DESN'TORS NOT USED ***	R35	.000		
0110	106363	RES MF 10.0K .12W .1% 50PPM	R36	1.000	14298	EE-1/8 RN60C
0111	11980401	RES MF 11.0K .1W .1% 50PPM/C	R37	1.000		C=RN55C1102B
0113	101577	RES CC1/4W 1.5K 5%	R39	1.000	01121	CB1525
0114	101567	RES CC1/4W 820 OHM 5%	R40	1.000	01121	CB8215
0115	119091	RES MF 29.4K .1W 1% 2	R41	1.000	91637	CMF-55 T9
0116	117818	RES MF 499OHMS.1 W 1% 100 PPM	R42	1.000		C=RN55D499DF
0117	101552	RES CC1/4W 15K 5%	R43	1.000	01121	CB1535
0118	101549	RES CC1/4W 30K 5%	R44	1.000	01121	CB3035
0120	101554	RES CC1/4W 24K 5%	R45-48	6.000	01121	CB2435
0120	99REF01	*** REF DESIG CONT FROM ABOVE	R60,61	.000		
0123	101576	RES CC1/4W 33K 5%	R49,50	3.000	01121	CB3335
0123	99REF01	*** REF DESIG CONT FROM ABOVE	R62	.000		
0125	101581	RES CC1/4W 1.2K 5%	R51-54	4.000	01121	CB1225
0132	99REF50	*** REF DESN'TORS NOT USED ***	R58,59	.000		
0137	101556	RES CC1/4W1.3K 5%	R63	1.000	01121	CB1325
0138	101609	RES CC 1/4W 100 OHM 5%	R64	1.000	01121	CB1015
0139	101498	RES CC 1/2W 100 OHM 5%	R65	1.000	01121	EB1015
0140	101755	RES CC1/4W430K 5%	R66	1.000	01121	CB4345
0141	101684	RES CC1/4W1.2M 5%	R67	1.000	01121	CB1255
0143	630520	RES WW PWR10K 3W 3%<30PPM<.63	R69	1.000	15915	TS2C

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0145	100521	TEST POINTBROWN PC MT PARALLE	TP1	1.000	91506	8041-163
0146	100522	TEST POINTRED PC MT PARALLE	TP2	1.000	91506	8041-164
0147	123103	TERM SWAGE TUB HO.062MAT.37HI.	TP3	1.000	91833	1540-2
0149	025758	IC OP AMP LM201A A94DB IB75NA	U1	1.000	27014	LM201AH
0150	11982801	IC OP AMP LF412 JFET DUAL A>88	U2	1.000	27014	LF412CH
0151	117838	IC OP AMP AD542LH JFET A104DB	U3	1.000	24335	AD542LH
0152	11982701	IC OP AMP LF411 JFET A>88DB IB	U4	1.000	27014	LF411CH
0153	102858	OPTOISOLTR CT6 DUAL IC/IF	U5,6	2.000	50522	MCT6
0155	103039	IC VOLTREG7815 15V 5%,1A,15W-.	U7	1.000	04713	MC7815CT
0156	11980701	IC VOLTREG MC7906CT -6V 5% 1A	U8	1.000	04713	MC7906CT
0157	117261	IC VOLTREG79L15 -15.6/14.4V .0	U9	1.000	04713	MC79L15ACP
0159	11980901	IC CMOS 14584 HEX SCHMITT TRIG	U11	1.000	04713	MC14584BCP
0160	103217	IC CMOS 4049 HEX INV BUFF LT	U12	1.000	02735	MC14049BCP
0161	106621	IC OP AMP 741C A86DB IB.5VA BD	U13	1.000	07263	741TC
0163	102879	JUMPER, 22AWG INSULATED .09D	W2,3,6,	4.000	55210	L-2007-1
0163	99REF01	*** REF DESIG CONT FROM ABOVE	11	.000		
0165	10062604	PHMS CRES 4-40 x 1/4		2.000	96906	MS51957-13
0166	100794	INT TOOTH #4 CRES		2.000	96906	MS35333-70
0167	99REF50	*** REF DESN'TORS NOT USED ***	W1,5,7-9	.000		
0168	99REF50	*** REF DESN'TORS NOT USED ***	W12	.000		
0180	707924802	SCHEM HFP150-3	REF	.000	52542	

SINGLE LEVEL EXPLOSION

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	065829	FAB PCB CONTROL		1.000	52542	
0002	065829TAB	ASSY PCB CONTROL HRF/GFP	REF	.000	52542	
0003	840420	XSTR MT PDTO-5 .355OD .038THK		2.000	07047	10079 DAP
0004	100492	SPCR SWAGE4-40 .125L X.25RND .		2.000	71279	1300-9
0005	11981301	CAP EL AX 1000UF 35V -10+50%	C1	1.000	74840	108TTA035A
0006	11982401	CAP EL AX 220UF 35V -20/75% (.	C2	1.000	74840	227TTA035A
0007	100211	CAP TANT 15UF 20V 10%	C3	1.000	56289	150D156X9020B2
0008	100176	CAP CER DP 1UF 50V 20% Z5U .36	C4,5,10	3.000	56289	2C37Z5U105M050B
0011	117621	CAP CER DP 10PF 100V 5% COG	C7	1.000	96773	DB44BY100J
0012	100225	CAP TANT 56UF 6V 10%	C8,9	2.000	56289	150D566X9006B2
0015	11979801	CAP CER DP .033UF 50V 10% X7R	C11	1.000	71590	CW20C333K
0016	11979701	CAP CER DP .022UF 50V 10% X7R	C12	1.000	71590	CW20C223K
0017	117636	CAP CER DP330PF 100V 5% COG .1	C13	1.000	96733	DB45BY331J
0018	117640	CAP CER DP 27PF 100V 5% COG .1	C14	1.000	96733	DB44BY270J
0019	99REF50	*** REF DESN'TORS NOT USED ***	C15	.000		
0020	116501	CAP CER DP2200PF 100V 10% X7R	C16	1.000	96733	DB44BX222K
0021	116501	CAP CER DP2200PF 100V 10% X7R	C17	1.000	96733	DB44BX222K
0022	100372	CAP C MOLD3300PF 100V 10% NPO	C18	1.000	26654	2130D0G100R332K
0023	100178	CAP CER DP .1UF 50V 20% Z5U .3	C19,24	3.000	56289	2C37Z5U104M050B
0023	99REF01	*** REF DESIG CONT FROM ABOVE	C25	.000		
0024	99REF50	*** REF DESN'TORS NOT USED ***	C20-23	.000		
0030	11982501	DIODE RECT BRDG MDA101 100V 1A	CR1	1.000	04713	MDA101A
0031	100426	DIODE SGNL1N459A 175V	CR3	1.000	13715	1N4594
0032	100383	DIODE ZENR 15V 5% .4W 1N965B	CR4	1.000	04713	1N965B
0033	103252	DIODE RECT 30S05 50V 3A@125C L	CR5,6	2.000	81483	30S05
0034	100383	DIODE SIG 1N4151 50V	CR8,9	21.000	03508	1N4151
0034	99REF01	*** REF DESIG CONT FROM ABOVE	CR12-30	.000		
0036	100416	DIODE ZENR6.8V 5% .4W 1N957B	CR7	1.000	04713	1N957B
0039	100395	DIODE ZENR 10V 5% .4W 1N961B	CR10	1.000	04713	1N961B
0040	102879	JUMPER, 22AWG INSULATED .09D	CR11,32	3.000	55210	L-2007-1
0040	99REF01	*** REF DESIG CONT FROM ABOVE	CR33	.000		
0060	100390	DIODE ZENR 12V 5% .4W 1N963B	CR31	1.000	04713	1N963B
0063	100404	DIODE ZENR 18V 5% .4W 1N967B	CR34	1.000	04713	1N967B
0064	99REF86	WIRE JUMPER	CR35	.000	52542	
0065	99REF86	WIRE JUMPER	CR36,37	.000	52542	
0066	11933801	SOCKET IC 24 PIN DIP PC MTG HI	J1	1.000	06776	ICT-246-S-TG
0067	11973201	CON PC 12 PIN RTANG HDR .1C-C	J2	1.000	27264	22-12-2124
0068	11981001	CON PC 8 PIN RTANG HDR .1C-C F	J3	1.000	27264	22-12-2084
0069	101376	XSTR SI NPN 2N2219	Q1	1.000	07263	2N2219
0070	700179	XSTR SIPNPMPS-A92 300V	Q2,3	2.000	04713	MPS-A92
0072	119945	XSTR SIPKP MM4003 250V 20BMIN	Q4	1.000	04713	MM4003
0073	101378	XSTR SI PNP 2N3906 40V 100@300	Q5	1.000	04713	2N3906
0074	101377	XSTR SI NPN 2N3904 40V 100@300	Q6	1.000	04713	2N3904
0075	102183	POT 15T PC500 10% 3/8W CERM E	R1	1.000	73138	B9PR500
0076	119007	RES MF 4.87K .1W 1% 25PPM/C	R2,3	2.000	91637	CMF-55 T9
0078	119041	RES MF 10.0K .1W 1% 25PPM/C	R4,14	2.000	91637	CMF-55 T9
0079	117576	RES MF 4.99K .1 W 1% 100PPM	R5	1.000		C=RN55D4991F

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0080	101564	RES CC1/4W 10M 5%	R6	1.000	01121	CB1065
0081	101559	RES CC1/4W 3.3K 5%	R7	1.000	01121	CB3325
0082	106002	RES CC1/4W2.4M 5%	R8	1.000	01121	CB2455
0083	102470	POT 15T PC 20K 10% 3/8W CERM E	R9	1.000	73138	89PR20K
0084	101569	RES CC 1/4W 1.0K 5%	R10	1.000	01121	CB1025
0086	102154	POT 15T PC 20 20% 3/8W CERM E	R12	1.000	73138	89PR20
0087	106179	RES MF 274 .12W 1% 50PPM	R13	1.000		RN60C2740F
0089	102472	POT 15T PC 10K 10% 3/8W CERM E	R15	1.000	73138	89PR10K
0090	10156901	RES CC1/4W1.0K 5% .4LS	R16,20	4.000	01121	CB1025
0090	99REF01	*** REF DESIG CONT FROM ABOVE	R23,57	.000		
0091	101608	RES CC1/4W 6.2K 5%	R17	1.000	01121	CB6225
0092	101572	RES CC1/4W 22K 5%	R18	1.000	01121	CB2235
0093	101537	RES CC1/4W300 OHMS 5%	R19	1.000	01121	CB3015
0095	101887	RES CC1/4W7.5 OHMS 5%	R21	1.000	01121	CB7565
0096	101570	RES CC1/4W 10K 5%	R22,24	5.000	01121	CB1035
0096	99REF01	*** REF DESIG CONT FROM ABOVE	38,68,70	.000		
0099	101577	RES CC1/4W 1.5K 5%	R25	1.000	01121	CB1525
0100	123227	RES MF 147K .1W 1% 25PPM/C	R26	1.000		C=RN55E1473F
0101	118844	RES MF 10.0K .1W .1% 5PPM/C	R27	1.000	60393	PR1/10 10K.1%T5
0102	102119	POT 15T PC 2K 10% 3/8W CERM E	R28	1.000	73138	89PR2K
0103	119070	RES MF 19.6K .1W 1% 2	R29	1.000	91637	CMF-55 T9
0104	117617	RES MF 150K .13W 1% 25PPM	R30,31	2.000	19701	5043RD150KF
0106	99REF50	*** REF DESN'TORS NOT USED ***	R32,69	.000		
0107	99REF50	*** REF DESN'TORS NOT USED ***	R33	.000		
0108	102473	POT 15T PC 5K 10% 3/8W CERM E	R34	1.000	73138	89PR5K
0109	99REF50	*** REF DESN'TORS NOT USED ***	R35	.000		
0110	106363	RES MF 10.0K .12W .1% 50PPM	R36	1.000	14298	EE-1/8 RN60C
0111	11980401	RES MF 11.0K .1W .1% 50PPM/C	R37	1.000		C=RN55C1102B
0113	101577	RES CC1/4W 1.5K 5%	R39	1.000	01121	CB1525
0114	101567	RES CC1/4W 820 OHM 5%	R40	1.000	01121	CB8215
0115	119091	RES MF 29.4K .1W 1% 2	R41	1.000	91637	CMF-55 T9
0116	117818	RES MF 4990HMS.1 W 1% 100 PPM	R42	1.000		C=RN55D4990F
0117	101552	RES CC1/4W 15K 5%	R43	1.000	01121	CB1535
0118	101549	RES CC1/4W 30K 5%	R44,45	2.000	01121	CB3035
0120	101554	RES CC1/4W 24K 5%	R46-48	5.000	01121	CB2435
0120	99REF01	*** REF DESIG CONT FROM ABOVE	R60,61	.000		
0123	101576	RES CC1/4W 33K 5%	R49,50	3.000	01121	CB3335
0123	99REF01	*** REF DESIG CONT FROM ABOVE	R62	.000		
0125	10158:	RES CC1/4W 1.2K 5%	R51-54	4.000	01121	CB1225
0132	99REF50	*** REF DESN'TORS NOT USED ***	R58,59	.000		
0137	101556	RES CC1/4W1.3K 5%	R63	1.000	01121	CB1325
0138	101609	RES CC 1/4W 100 OHM 5%	R64	1.000	01121	CB1015
0139	101498	RES CC 1/2W 100 OHM 5%	R65	1.000	01121	EB1015
0145	100521	TEST POINTBROWN PC MT PARALLE	TP1	1.000	91506	3041-163
0146	100522	TEST POINTRED PC MT PARALLE	TP2	1.000	91506	3041-164
0147	123103	TERM SWAGE TUB HO.062MAT.37HI.	TP3	1.000	91833	1540-2
0149	025758	IC OP AMP LM201A A94DB IB75NA	U1	1.000	27014	LM201AH

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0150	11982801	IC OP AMP LF412 JFET DUAL A>BB	U2	1.000	27014	LF412CH
0151	117838	IC OP AMP AD542LH JFET A104DB	U3	1.000	24355	AD542LH
0152	11982701	IC OP AMP LF411 JFET A>B8DB IB	U4	1.000	27014	LF411CH
0153	102858	OPTOISOLTR CT6 DUAL IC/IF	U5,6	2.000	50522	MCT6
0155	103039	IC VOLTREG7815 15V 5%,1A,15W-.	U7	1.000	04713	MC7815CT
0156	11980701	IC VOLTREG MC7906CT -6V 5% 1A	U8	1.000	04713	MC7906CT
0157	117261	IC VOLTREG79L15 -15.6/14.4V .0	U9	1.000	04713	MC79L15ACP
0159	11980901	IC CMOS 14584 HEX SCHMITT TRIG	U11	1.000	04713	MC14584BCP
0160	103217	IC CMOS 4049 HEX INV BUFF LT	U12	1.000	02735	MC14049BCP
0161	106621	IC OP AMP 741C A86DB IB.5VA 8D	U13	1.000	07263	741TC
0163	102879	JUMPER, 22AWG INSULATED .09D	W2,3,6,	4.000	55210	L-2007-1
0163	99REF01	*** REF DESIG CONT FROM ABOVE	11	.000		
0165	10062604	P-HD CRES 4-40 X 1/4		2.000	96906	MS51957-13
0166	100794	INT TOOTH #4 CRES		2.000	96906	MS35333-70
0167	99REF50	*** REF DESN'TORS NOT USED ***	W1,5,7-9	.000		
0168	99REF50	*** REF DESN'TORS NOT USED ***	W12	.000		
0180	707910801	SCHEM HFP150-2	REF	.000	52542	

ASSY PCB HEATSINK SP HFP30-15 11/21/86 07923601 A-----A 2/10/86

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	079236	FAB PCB HS - SERIESS/PASS HFP		1.000	52542	
0002	630029	RES WW PWR.15 5W 3% <90PPM/C<.	R4,5,6	3.000	12463	T-5
0003	123593	CON 1CCT PC PIN .250W .032TH.		2.000	79963	901
0004	11947401	CONN PC 4 PIN RT ANGLAR .1C-C		1.000	27264	22-05-3041
0005	123594	NUT SYNC-1SO BLIND .166MTG		8.000	78187	8956-06-01
0006	100474	BIFURCATED SWAGE TERM		2.000	88245	2010B
0007	720454	DIODE RECTIN4720 100V 3A TOP H	CR5	1.000	04713	1N4720
0008	101632	RES CC1/2W 10 OHM 5%	R3	1.000	01121	EB1005

ASSY PCB HEATSINK SF HFP30-15 11/21/86 07923602 A-----A 2/10/86

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	079236	FAB PCB HS - SERIESS/PASS HFP		1.000	52542	
0002	630029	RES WW PWR.15 5W 3% <90PPM/C<.	R7,8,9	3.000	12463	T-5
0003	123684	CON 1CCT PCRTNG PIN.110W.032TH		1.000	79963	948
0004	123593	CON 1CCT PC PIN .250W .032TH.		2.000	79963	901
0005	123594	NUT SYNC-1SO BLIND .166MTG		6.000	78187	8956-06-01

ASSY PCB SER PASS HFP150-3 LFT 11/21/86 07923605 1-----1 8/08/86

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	079236	FAB PCB HS - SERIES5/PASS HFP		1.000	52542	
0002	103413	RES WW PWR.51 5% 2W	R4,5,6	3.000	75042	BWH
0003	11947401	CONN PC 4 PIN RT ANGLAR .1C-C		1.000	27264	22-05-3041
0004	123593	CON 1CCT PC PIN .250W .032TH.		2.000	79963	901
0005	720456	DIODE RECTIN4722 400V 3A TOP H	CR5	1.000	04713	IN4722
0006	123594	NUT SYNC-16D BLIND .166MTG		8.000	78187	8956-06-01
0007	101615	RES CC1/4W 150 OHM 5%	R3	1.000	01121	CB1515

ASSY PCB SER PASS HFP150-3 RT 11/21/86 07923606 1-----1 8/08/86

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	079236	FAB PCB HS - SERIES5/PASS HFP		1.000	52542	
0002	103413	RES WW PWR.51 5% 2W	R7,8,9	3.000	75042	BWH
0003	123593	CON 1CCT PC PIN .250W .032TH.		2.000	79963	901
0004	123684	CON 1CCT PCRTNG PIN.110W.032TH		1.000	79963	948
0005	123594	NUT SYNC-16D BLIND .166MTG		6.000	78187	8956-06-01

ASSY PCB HEATSINK SP HFP150-2 11/21/86 07923603 A-----A 2/10/86

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	079236	FAB PCB HS - SERIESS/PASS HFP		1.000	52542	
0002	103413	RES WW PWR.51 5% 2W	R7,9	2.000	75042	BWH
0003	123593	CON 1CCT PC PIN .250W .032TH.		2.000	79963	901
0004	123684	CON 1CCT PCRTNB PIN.110W.032TH		1.000	79963	948
0005	123594	NUT SYNC-1SS BLIND .166MTG		4.000	78187	8956-06-01

ASSY PCB HEATSINK SP HFP 150- 11/21/86 07923604 A-----A 2/10/8o

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	079236	FAB PCB HS - SERIESS/PASS HFP		1.000	52542	
0002	103413	RES WW PWR.51 5% 2W	R4,6	2.000	75042	BWH
0003	11947401	CONN PC 4 PIN RT ANGLAR .1C-C		1.000	27264	22-05-3041
0004	123593	CON 1CCT PC PIN .250W .032TH.		2.000	79963	901
0005	720456	DIODE RECTIN4722 400V 3A TOP H	CR5	1.000	04713	IN4722
0006	123594	NUT SYNC-1SO BLIND .166MTG		6.000	78187	8956-06-01
0007	101615	RES CC1/4W 150 OHM 5%	R3	1.000	01121	CB1515
0008	100474	BIFURCATED SWABE TERM		2.000	88245	2010B

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	079235	FAB PCB SWITCH CONTROL HFP		1.000	52542	
0002	079235TAB	DWG ASSY PCB SWITCH CNTL HFP	REF	.000	52542	
0005	100125	CAP TANT 22UF 15V 10%	C1	1.000	56289	150D226X9015B2
0007	11982501	DIODE RECT BRDG MDA101 100V 1A	CR1	1.000	04713	MDA101A
0008	100385	DIODE SIG 1N4151 50V	CR2	1.000	03508	1N4151
0009	100426	DIODE SGNL1N459A 175V	CR3	1.000	13715	1N459A
0010	99REF50	*** REF DESN'TORS NOT USED ***	CR4	.000		
0011	100482	TERM SWAGEBIFUR .062MAT.16HI.0		7.000	88245	2000B-1
0012	11973001	CON PC PIN 10 RTANG HDR .1C-C	J1	1.000	27264	22-12-2104
0014	101377	XSTR SI NPN 2N3904 40V 100B300	Q1	1.000	04713	2N3904
0016	101569	RES CC 1/4W 1.0K 5%	R1	1.000	01121	CB1025
0017	101570	RES CC1/4W 10K 5%	R2	1.000	01121	CB1035
0018	117585	RES MF 10.0K .1 W 1% 100PPM	R3	1.000		C=RN55D1002F
0019	117585	RES MF 10.0K .1 W 1% 100PPM	R4	1.000		C=RN55D1002F
0020	117585	RES MF 10.0K .1 W 1% 100PPM	R5	1.000		C=RN55D1002F
0021	117860	RES MF 1.74K .1W 1% 100PPM	R6	1.000		C=RN55D1741F
0022	117810	RES MF 2.49K .1 W 1% 100PPM	R7	1.000		C=RN55D2491F
0023	101587	RES CC1/4W 27K 5%	R8	1.000	01121	CB2735
0024	103413	RES WW PWR.51 5% 2W	R9	1.000	75042	BWH
0026	123568	OPTOISOLTR 6N139 CTR>500@1.6MA	U1	1.000	28480	6N139
0027	119985	IC LIN DUAL COMPTR 8PIN DIP	U2	1.000	27041	LM393

ASSY PCB SWITCH CONTROL HFP150 1/23/87 07923502 A-----A 2/10/86

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	079235	FAB PCB SWITCH CONTROL HFP		1.000	52542	
0002	079235TAB	DWG ASSY PCB SWITCH CNTL HFP	REF	.000	52542	
0005	100125	CAP TANT 22UF 15V 10%	C1	1.000	56289	150D226X9015B2
0007	11982501	DIODE RECT BRDG MDA101 100V 1A	CR1	1.000	04713	MDA101A
0008	100385	DIODE SIG 1N4151 50V	CR2	1.000	03508	1N4151
0009	100426	DIODE SGNL1N459A 175V	CR3	1.000	13715	1N459A
0010	100385	DIODE SIG 1N4151 50V	CR4	1.000	03508	1N4151
0011	100416	DIODE ZENR6.8V 5% .4W 1N957B	CR5	1.000	04713	1N957B
0012	11973001	CON PC PIN 10 RTANG HDR .1C-C	J1	1.000	27264	22-12-2104
0013	100482	TERM SWAGEBIFUR .062MAT.16HI.0		7.000	88245	2000B-1
0014	101377	XSTR SI NPN 2N3904 40V 100B300	Q1	1.000	04713	2N3904
0016	101569	RES CC 1/4W 1.0K 5%	R1	1.000	01121	CB1025
0017	101570	RES CC1/4W 10K 5%	R2	1.000	01121	CB1035
0018	102222	RES MF 80.6K .12W 1% 100P	R3	1.000	19701	MF5C-D-8062-F
0019	102222	RES MF 80.6K .12W 1% 100P	R4	1.000	19701	MF5C-D-8062-F
0020	117585	RES MF 10.0K .1 W 1% 100PPM	R5	1.000		C=RN55D1002F
0021	119005	RES MF 4.64K .1W 1% 25PPM/C	R6	1.000	91637	CMF-55 T9
0022	118976	RES MF 2.55K .1W 1% 25PPM/C	R7	1.000	91637	CMF-55 T9
0023	101587	RES CC1/4W 27K 5%	R8	1.000	01121	CB2735
0024	101671	RES CC 1/2W 2.7 OHMS 5%	R9	1.000		
0026	123568	OPTOISOLTR 6N139 CTR>500@1.6MA	U1	1.000	28480	6N139
0027	119985	IC LIN DUAL COMPTR 8PIN DIP	U2	1.000	27041	LM393
0030	7079235TAB	SCHEMATIC SWITCH CONTROL PCB	REF	.000	52542	

SINGLE LEVEL EXPLOSION

ASSY HEATSINK S/P RHT HFP30-15 11/21/86 07924904 A-----A 2/12/86

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	079236	FAB HEATSINK SERIES PASS		1.000	52542	
0002	07923602	ASSY PCB HEATSINK SP HFP30-15		1.000	52542	
0003	700087	XSTR SINPN 2N6258 80V 20Bo0@15	Q7-9	3.000		2N6258
0004	103358	INS XISTORTO-3 MICA.05LD.14MT		3.000	08289	DM-111
0005	10063208	PHMS CRES 6-32 * 1/2		6.000	96906	MS51957-30
0006	100647	INT TOOTH #6 CRES		6.000	96906	MS35333-71

ASSY HEATSINK S/P LFT HFP30-15 11/21/86 07924903 A-----A 2/12/86

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	079238	FAB HEATSINK SERIES PASS		1.000	52542	
0002	07923601	ASSY PCB HEATSINK SP HFP30-15		1.000	52542	
0003	700087	XSTR SINPN 2N6258 80V 20Bo0@15	Q4-6	3.000		2N6258
0004	103358	INS XISTORTO-3 MICA.05LD.14MT		3.000	08289	DM-111
0006	06585701	SW THERMAL NO CLOSE 131C+-4C		1.000	52542	
0007	10062604	PHMS CRES 4-40 X 1/4		2.000	96906	MS51957-13
0008	100794	INT TOOTH #4 CRES		2.000	96906	MS35333-70
0009	10063208	PHMS CRES 6-32 * 1/2		6.000	96906	MS51957-30
0010	100647	INT TOOTH #6 CRES		8.000	96906	MS35333-71
0011	PHANTOM 5079280	WIRE LIST LOOSE HFP	REF	.000	52542	
0012	123260	XSTR SINPN 2N6374 50V TO-66	Q3	1.000		2N6374
0013	100551	INS XISTORTO-66 MICA		1.000	08289	TA-2402-A
0014	102442	CON IDCTPSCKT PIN .04X.35MAX		2.000	06776	PS-403-30

ASSY HEATSINK S/P LEFT HFP 150 1/23/87 07924905 A-----A 8/08/86

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	079238	FAB HEATSINK SERIES PASS		1.000	52542	
0002	PHANTOM 07923605	ASSY PCB SER PASS HFP150-3 LFT		1.000	52542	
0003	116876	XSTR SINPN2N6259 150V TO-3	Q4,5,6	3.000	02735	2N6259
0004	103358	INS XISTORTO-3 MICA.05LD.14MT		3.000	08289	DM-111
0006	06585701	SW THERMAL NO CLOSE 131C+-4C	S1	1.000	52542	
0007	10062604	PHMS CRES 4-40 * 1/4		2.000	96906	MS51957-13
0008	100794	INT TOOTH #4 CRES		2.000	96906	MS35333-70
0009	10063208	PHMS CRES 6-32 * 1/2		8.000	96906	MS51957-30
0010	100647	INT TOOTH #6 CRES		8.000	96906	MS35333-71
0011	PHANTOM 5079268	WIRE LIST LOOSE HFP		.000	52542	
0012	102738	XSTR SINPN2N3738 225	Q3	1.000	04713	2N3738
0013	100551	INS XISTORTO-66 MICA		1.000	08289	TA-2402-A
0014	102442	CON 1CCTPSCKT PIN .04X.35MAX		2.000	06776	PS-403-30

SINGLE LEVEL EXPLOSION

ASSY HEATSINK S/P RIGHT HFP150 11/21/86 07924906 1-----1 8/08/86

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	079238	FAB HEATSINK SERIES PASS		1.000	52542	
0002	PHANTOM 07923606	ASSY PCB SER PASS HFP150-3 RT		1.000	52542	
0003	116876	XSTR SINPN2N5259 150V TO-3	Q7,8,9	3.000	02735	2N6259
0004	103358	INS XISTORTO-3 MICA.05LD.14MT		3.000	08289	DM-111
0005	10063208	PHMS CRES 6-32 * 1/2		6.000	96906	MS51957-30
0006	100647	INT TOOTH #6 CRES		6.000	96906	MS35333-71

ASSY HEATSINK S/P LEFT HFP150 11/21/86 07924902 A-----A 2/10/86

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	079238	FAB HEATSINK SERIES PASS		1.000	52542	
0002	07923604	ASSY PCB HEATSINK SP HFP 150-		1.000	52542	
0003	116876	XSTR SINPN2N6259 150V TO-3	Q4,6	2.000	02735	2N6259
0004	103358	INS XISTORTO-3 MICA.05LD.14MT		2.000	08289	DM-111
0005	06585701	Sw THERMAL NO CLOSE 131C+-4C	S1	1.000	52542	
0006	100551	INS XISTORTO-66 MICA		1.000	08289	TA-2402-A
0007	102738	XSTR SINPN2N3738 225	Q3	1.000	04713	2N3738
0008	10062604	PHMS CRES 4-40 X 1/4		2.000	96906	MS51957-13
0009	100794	INT TOOTH #4 CRES		2.000	96906	MS35333-70
0010	10063208	PHMS CRES 6-32 * 1/2		6.000	96906	MS51957-30
0011	100647	INT TOOTH #6 CRES		6.000	96906	MS35333-71
0012	PHANTOM 5079268	WIRE LIST LOOSE HFP	REF	.000	52542	
0013	102442	CON 1CCTPSCKT PIN .04X.35MAX		2.000	06776	PS-403-30

ASSY HEATSINK S/P RIGHT HFP150 11/21/86 07924901 A-----A 2/10/86

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	079238	FAB HEATSINK SERIES PASS		1.000	52542	
0002	07923603	ASSY PCB HEATSINK SP HFP150-2		1.000	52542	
0003	116876	XSTR SINPN2N6259 150V TO-3	Q7,9	2.000	02735	2N6259
0004	103358	INS XISTORTO-3 MICA.05LD.14MT		2.000	08289	DM-111
0005	10063208	PHMS CRES 6-32 * 1/2		4.000	96906	MS51957-30
0006	100647	INT TOOTH #6 CRES		4.000	96906	MS35333-71

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	079197	FAB SUPPORT HEATSINK HFP		1.000	52542	
0002	117655	DIODE RECTMDA2502 200V 25A BRI	CR1	1.000	04713	MDA2502
0003	123288	MOSFET NCH IRF133 60V RDS(.25	Q2	1.000	04713	IRF133
0004	116604	SCR 2N3896 35A 100A TO-48 MOD	CR3	1.000	04713	2N3896
0005	720335	DIODE RECTIN1184A-40HF10 100V	CR2,4	2.000		IN1184A
0006	123661	MOSFET NCH MTM35N05 50V 35A RD	Q1	1.000	04713	MTM35N05
0007	106447	CAP EL AX 35UF 50V 3/8X11/4L	C5	1.000	56289	TE1306
0009	830099	SOCKT XSTR TO-3 DIAL PH SINGLE	XQ1,2	1.000	06776	MD-3452-8
0010	103358	INS XISTORTO-3 MICA.05LD.14MT		2.000	08289	DM-111
0011	123086	LUG SOLDER .255ID 1.125L 1HOLE		3.000	86928	5411-35
0012	123087	MICA WSHR 1.00D .250ID .002T		6.000	86928	5624-72-2
0013	123088	INSL XTR .373OD .283ID .051T		3.000	86928	5612-80-50
0014	106987	FLAT WSHR .265ID*.50		3.000		AN960-416L
0015	103004	INT TOOTH .261 ID.402 OD CPS		3.000	78189	1214-05
0016	123090	NUT HEX 1/4-28 .43AF .156T CDP		3.000		BY DESCRIPTION
0017	10063207	PHMS CRES 6-32 * 7/16		2.000	96906	MS51957-29
0018	123051	DELRIN WSHRSHLDR .375DX.048THK		2.000	08530	495334-3
0019	100486	LUG SOLDER#6INT TOOTH.72L 2HOL		1.000	83330	1413-6
0020	112472	NUT 6-32, KEP		2.000	78189	511-061800-01
0021	100704	FLAT WSHR 6 .156 ID.312 OD CR		5.000	96906	MS15795-805
0022	10063208	PHMS CRES 6-32 * 1/2		2.000	96906	MS51957-30
0023	100647	INT TOOTH #6 CRES		6.000	96906	MS35333-71
0024	100705	FLAT WSHR 8 .187 ID.375 OD CR		1.000	96906	MS15795-807
0025	100940	NUT KEP 8-32 .3750D .16THK C		1.000	78189	511-081800-00
0026	11958601	SPCR THRDD 6-32 1.125.25HEX CR		2.000	06540	8222-SS-0632-7
0027	112609	WSHR FLAT #6.150ID.312OD		2.000	86928	5810-44-31
0028	10073106	PHMS CRES 6-32 X3/8		2.000	96906	MS24693-C26
0029	10063204	PHMS CRES 6-32 * 1/4		2.000	96906	MS51957-26
0030	07923501	ASSY PCB SWITCH CONTROL HFP30	A2	1.000	52542	
0031	101569	RES CC 1/4W 1.0K 5%	R11,12	2.000	01121	CB1025
0032	PHANTOM 5079281	WIRE LIST LOOSE HFP	REF	.000	52542	
0033	117570	CAP CER DF .01 UF 100V 20% X7R	C7	1.000	04222	SR201C103MAA
0034	860020	TERM SCRMT4-40 INSL .38HI BIFU		2.000	17117	2304-14-1
0035	100753	TIE CABLE 0-3/4 NAT NYLON 4IN		1.000	96906	MS3367-4-9
0036	10072003	PHMS CRES 4-40X3/16		2.000	96906	MS24693-C1
0037	100794	INT TOOTH #4 CRES		2.000	96906	MS35333-70

ASSY HEATSINK SUPPORT HFP150 1/23/87 07923902 B-----B 2/10/86

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	079239	FAB SUPPORT HEATSINK HFP		1.000	52542	
0002	119218	DIODE RECTMDA2504 400V 25A BRI	CR1	1.000	04713	MDA2504
0003	11986001	MOSFET NCH IRF333 350V RDS<1.5	Q1,2	2.000	04713	IRF333
0004	630017	RES WW PWR.4 3% 5W CRLTC	R13	1.000	15915	TSA5
0005	116605	SCR MCR3918-4 20A 200V TO-48	CR3	1.000	04713	MCR3918-4
0006	102884	DIODE RECT1N1202A 200V 12A	CR2,4	2.000	02735	1N1202A
0007	102625	CAP EL AX 2UF 450V +50/-10%.62	C5	1.000	90201	TC695
0008	800304	CCAP 1.0MF-250V-MM	C7	1.000		
0009	101569	RES CC 1/4W 1.0K 5%	R11,12	2.000	01121	CB1025
0010	830099	SOCKT XSTR TO-3 DIAL PH SINGLE	XQ1,2	2.000	06776	MD-3452-6
0011	103358	INS XISTORTO-3 MICA.05LD.14MT		2.000	08289	DM-111
0012	123060	LUG SOLDER.196MTG.81L.120HOLE		2.000	06540	20209#10
0013	101067	MICA WASHER.192ID.625OD.005THK		4.000	86928	5624-9-5
0014	12306201	INSUL RING .197ID.280OD.050THK		2.000	86928	5612-62-50
0015	100648	FLAT WSHR 10 .218 ID.437 OD CR		2.000	96906	MS15795-808
0016	100698	WASHER INT LOCK #10		2.000	96906	MS35333-73
0017	100709	NUT HES #10-32		2.000	96906	MS35650-104
0018	123086	LUG SOLDER .255ID 1.125L 1HOLE		1.000	86928	5411-35
0019	123087	MICA WSHR 1.00D .250ID .002T		2.000	86928	5624-72-2
0020	123088	INSL XTR .373OD .283ID .051T		1.000	86928	5612-80-50
0021	106987	FLAT WSHR .265ID#.50		1.000		AN960-416L
0022	103004	INT TOOTH .261 ID.402 OD CPS		1.000	78189	1214-05
0023	123090	NUT HEX 1/4-28 .43AF .156T CDP		1.000		BY DESCRIPTION
0024	100705	FLAT WSHR 8 .187 ID.375 OD CR		1.000	96906	MS15795-807
0025	100940	NUT KEP 8-32 .375OD .16THK C		1.000	78189	511-081800-00
0026	100704	FLAT WSHR 6 .156 ID.312 OD CR		4.000	96906	MS15795-805
0027	100647	INT TOOTH #6 CRES		4.000	96906	MS35333-71
0028	10063208	PHMS CRES 6-32 * 1/2		4.000	96906	MS51957-30
0029	11958601	SPCR THRDD 6-32 1.125.25HEX CR		2.000	06540	8222-SS-0632-7
0030	112609	NYL WSHR FLAT #6.150ID.312OD		2.000	86928	5610-44-31
0031	10073106	FHMS CRES 6-32 * 3/8		2.000	96906	MS24693-C26
0032	10063204	PHMS CRES 6-32 * 1/4		2.000	96906	MS51957-26
0033	07923502	ASSY PCB SWITCH CONTROL HFP150	A2	1.000	52542	
0034	860020	TERM SCRMT4-40 INSL .38HI BIFU		2.000	17117	2304-14-1
0035	100753	TIE CABLE 0-3/4 NAT NYLON 4IN		1.000	96906	MS3367-4-9
0036	10072003	FHMS CRES 4-40X3/16		2.000	96906	MS24693-C1
0037	100794	INT TOOTH #4 CRES		2.000	96906	MS35333-70
0038	PHANTOM 5079268	WIRE LIST LOOSE HFP	REF	.000	52542	
0040	840091	CCLIP CAP KKC-6		1.000		

SINGLE LEVEL EXPLOSION

ASSY HEATSINK TOP HFP30-15 11/21/86 07926301 A-----A 2/10/86

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	PHANTOM 07924904	ASSY HEATSINK S/P RHT HFP30-15		1.000	52542	
0002	PHANTOM 07924903	ASSY HEATSINK S/P LFT HFP30-15		1.000	52542	
0003	PHANTOM 07923901	ASSY HEATSINK SUPPORT HFP30-15		1.000	52542	
0006	10063248	PHMS CRES 6-32*3 TYPE I RECESS		1.000	08547	BY DESCR.
0007	100647	INT TOOTH #6 CRES		2.000	96906	MS35333-71
0008	100704	FLAT WSHR 6 .156 ID.312 OD CR		1.000	96906	MS15795-805
0009	079285	FAB BRKT MTG PCB HFP SERIES		1.000	52542	
0010	079247	FAB PLATE HEATSINK MTG HFP		1.000	52542	
0011	10063210	PHMS CRES 6-32 * 5/8		1.000	96906	MS51957-31
0012	100687	INT TOOTH #8 CRES		2.000	96906	MS35333-72
0013	10064206	PHMS CRES 8-32 X 3/8		2.000	96906	MS51957-43

ASSY HEATSINK TOP HFP150-3 11/21/86 07926303 1-----1 8/06/86

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	PHANTOM 07924905	ASSY HEATSINK S/P LEFT HFP 150		1.000	52542	
0002	PHANTOM 07924906	ASSY HEATSINK S/P RIGHT HFP150		1.000	52542	
0003	PHANTOM 07923902	ASSY HEATSINK SUPPORT HFP150		1.000	52542	
0006	10063248	PHMS CRES 6-32*3 TYPE I RECESS		1.000	08547	BY DESCR.
0007	100647	INT TOOTH #6 CRES		2.000	96906	MS35333-71
0008	100704	FLAT WSHR 6 .156 ID.312 OD CR		1.000	96906	MS15795-805
0009	079285	FAB BRKT MTG PCB HFP SERIES		1.000	52542	
0010	079247	FAB PLATE HEATSINK MTG HFP		1.000	52542	
0011	10063210	PHMS CRES 6-32 * 5/8		1.000	96906	MS51957-31
0012	100687	INT TOOTH #8 CRES		2.000	96906	MS35333-72
0013	10064206	PHMS CRES 8-32 X 3/8		2.000	96906	MS51957-43

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	PHANTOM 07924902	ASSY HEATSINK S/P LEFT HFP150		1.000	52542	
0002	PHANTOM 07924901	ASSY HEATSINK S/P RIGHT HFP150		1.000	52542	
0003	PHANTOM 07923902	ASSY HEATSINK SUPPORT HFP150		1.000	52542	
0006	10063248	PHMS CRES 6-32*3 TYPE I RECESS		1.000	08547	BY DESCR.
0007	100647	INT TOOTH #6 CRES		2.000	96906	MS35333-71
0008	100704	FLAT WSHR 6 .156 ID.312 OD CR		1.000	96906	MS15795-805
0009	079285	FAB BRKT MTG PCB HFP SERIES		1.000	52542	
0010	079247	FAB PLATE HEATSINK MTG HFP		1.000	52542	
0011	10063210	PHMS CRES 6-32 * 5/8		1.000	96906	MS51957-31
0012	100687	INT TOOTH #8 CRES		2.000	96906	MS35333-72
0013	10064206	PHMS CRES 8-32 X 3/8		2.000	96906	MS51957-43

ASSY XFORMER TI HFP30-15 11/21/86 07926201 A-----A 2/10/86

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	504386	ASSY XFORMER HFP30-15	T1	1.000	52542	
0002	100074	CAP C DISC.05 UF 600V +80-20%		1.000	91418	TYPE B
0003	079244	FAB BRKT XFORMER HFP		1.000	52542	
0004	079245	FAB BRKT XFORMER HFP		1.000	52542	
0006	11979901	RNDHDMS 10-32*4.00 ZINC PLTD S		4.000	52542	BY DESCR
0007	103655	BUSH SHLDR 10*.38L@.26D .06L@.		8.000	83330	2537
0008	100648	FLAT WSHR 10 .218 ID.437 OD CR		10.000	96906	MS15795-808
0009	100939	NUT KEP 10-32 .4060D .16TKK		5.000	78189	511-101800-50
0010	079262TAB	DWG ASSY XFORMER TI HFP	REF	.000	52542	
0011	07926501	ASSY CABLE J4 HFP		1.000	52542	
0012	123354	HEX HD MS 10-32X1/2 CRES		3.000		BY DESCRIPTION
0013	100989	LUG SOLDER #10INT TOOTH.69L2		3.000	78189	2104-10-00
0014	117118	WSHR CRRSN .21ID.430D .014@485		3.000	52829	SP-115310
0015	100709	NUT HES #10-32		3.000	96906	MS35650-104
0016	123748	HEX HD MS 8-32X1/2 CRES		2.000		BY DESCRIPTION
0017	117117	WSHR CRRSN8 .17ID.350D.0116270		2.000	52829	SP-94306
0018	100708	NUT HEX 8-32 .31AF.13THK SS		2.000	80205	NAS671C8
0019	102961	LUG SOLDER #8INT TOOTH .64L		2.000	78189	2104-08-00

ASSY XFORMER HFP150-3 11/21/86 07926202 A-----A 2/10/86

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	504388	ASSY XFORMER HFP150-3	T1	1.000	52542	
0002	100074	CAP C DISC.05 UF 600v +80-20%	C1,2	2.000	91418	TYPE B
0003	079244	FAB BRKT XFORMER HFP		1.000	52542	
0004	079245	FAB BRKT XFORMER HFP		1.000	52542	
0006	11979901	RNDHDMS 10-32*4.00 ZINC PLTD S		4.000	52542	BY DESCR
0007	103655	BUSH SHLDR 10*.38L@.26D .06L@.		8.000	83330	2537
0008	100648	FLAT WSHR 10 .218 ID.437 OD CR		10.000	96906	MS15795-808
0009	100939	NUT KEP 10-32 .4060D .16TKK		5.000	78189	511-101800-50
0010	079262TAB	DWG ASSY XFORMER TI HFP	REF	.000	52542	
0011	07926501	ASSY CABLE J4 HFP		1.000	52542	

ASSY PANEL REAR HFP30-15 11/21/86 07927801 A-----A 2/12/86

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	079278	FAB PANEL REAR HFP		1.000	52542	
0002	123588	FAN 3.62SQ*1.5 45CFM 115V 50/B	B1	1.000	60856	113XN-2182
0003	PHANTOM 07926401	ASSY SHUNT HFP30-15	R9	1.000	52542	
0004	06585603	ASSY CABLE RIBBON HFP		1.000	52542	
0005	101288	CONN POWERMALE CH RECEPT AC W/	J1	1.000	82389	EAC-301
0006	11983001	BUSHING SNAP NYLON .187 OD.375		3.000	28520	2020/SB-375-3
0007	123592	GUARD FINGER 3.62 SQ FAN		1.000	60856	9901-43
0008	07929101	ASSY CABLE AC HFP		1.000	52542	
0009	10062607	PHMS CRES 4-40X7/16		2.000	96906	MS51957-16
0010	100683	FLAT WSHR 4 .115 ID.210 OD ST		2.000	80205	NAS620-42
0011	100941	NUT KEP 4-40 .2810D .11THK C		2.000	78189	511-041800-00
0012	07382601	073827 MODEL/SERIAL/PART FOILC		1.000	52542	
0013	10063208	PHMS CRES 6-32 * 1/2		4.000	96906	MS51957-30
0014	10063205	PHMS CRES 6-32 * 5/16		1.000	96906	MS51957-27
0015	112604	FLAT WSHR 6 .147ID .3750D .03T		2.000	96928	5714-34-32N
0016	100647	INT TOOTH #6 CRES		3.000	96906	MS35333-71
0017	112472	NUT 6-32, KEP		2.000	78189	511-061800-01
0018	10062604	PHMS CRES 4-40 X 1/4		4.000	96906	MS51957-13
0019	100711	WSHR LOCK SPLT #4		4.000	96906	MS35338-135
0020	079278TAB	DWG ASSY PANEL REAR HFP	REF	.000	52542	

ASSY PANEL REAR HFP150-3 11/21/86 07924102 A-----A 6/08/86

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	079241	FAB PANEL REAR HFP		1.000	52542	
0002	123582	FAN 3.62SQ*1.5 45CFM 115V 50/B	B1	1.000	60856	113XN-2182
0003	PHANTOM 07926403	ASSY SHUNT HFP150-3 .05Ω OHMS	R9	1.000	52542	
0004	06585603	ASSY CABLE RIBBON HFP		1.000	52542	
0005	101288	CONN POWERMALE CH RECEPT AC W/	J1	1.000	82389	EAC-301
0006	11983001	BUSHING SNAP NYLON .187 OD.375		3.000	28520	2020/SB-375-3
0007	123592	GUARD FINGER 3.62 SQ FAN		1.000	60856	9901-43
0008	07929101	ASSY CABLE AC HFP		1.000	52542	
0009	10062607	PHMS CRES 4-40X7/16		2.000	96906	MS51957-16
0010	100683	FLAT WSHR 4 .115 ID.210 OD ST		2.000	80205	NAS620-42
0011	100941	NUT KEP 4-40 .2810D .11THK C		2.000	78189	511-041800-00
0012	07382601	073827 MODEL/SERIAL/PART FOILC		1.000	52542	
0013	10063208	PHMS CRES 6-32 * 1/2		4.000	96906	MS51957-30
0014	10063205	PHMS CRES 6-32 * 5/16		1.000	96906	MS51957-27
0015	100704	FLAT WSHR 6 .156 ID.312 OD CR		2.000	96906	MS15795-805
0016	100647	INT TOOTH #6 CRES		3.000	96906	MS35333-71
0017	112472	NUT 6-32, KEP		2.000	78189	511-061800-01
0018	10062604	PHMS CRES 4-40 X 1/4		4.000	96906	MS51957-13
0019	100711	WSHR LOCK SPLT #4		4.000	96906	MS35338-135
0020	079241TAB	DWG ASSY PANEL REAR HFP	REF	.000	52542	

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	079241	FAB PANEL REAR HFP		1.000	52542	
0002	123588	FAN 3.62SQ*1.5 45CFM 115V 50/B	B1	1.000	60856	113XN-2182
0003	PHANTOM 07926402	ASSY SHUNT HFP150-2	R10	1.000	52542	
0004	06585603	ASSY CABLE RIBBON HFP		1.000	52542	
0005	101288	CONN POWERMALE CH RECEPT AC W/	J1	1.000	82389	EAC-301
0006	11983001	BUSHING SNAP NYLON .187 OD.375		3.000	28520	2020/SB-375-3
0007	123592	GUARD FINGER 3.62 SQ FAN		1.000	60E56	9901-43
0008	07929101	ASSY CABLE AC HFP		1.000	52542	
0009	10062607	PHMS CRES 4-40X7/16		2.000	96906	MS51957-16
0010	100683	FLAT WSHR 4 .115 ID.210 OD ST		2.000	80205	NAS620-42
0011	100941	NUT KEP 4-40 .2810D .11THK C		2.000	78189	511-041800-00
0012	07382601	073827 MODEL/SERIAL/PART FOILC		1.000	52542	
0013	10063208	PHMS CRES 6-32 * 1/2		4.000	96906	MS51957-30
0014	10063205	PHMS CRES 6-32 * 5/16		1.000	96906	MS51957-27
0015	112604	FLAT WSHR 6 .147ID .3750D .03T		2.000	86928	5714-34-32N
0016	100647	INT TOOTH #6 CRES		3.000	96906	MS35333-71
0017	112472	NUT 6-32, KEP		2.000	78189	511-061800-01
0018	10062604	PHMS CRES 4-40 X 1/4		4.000	96906	MS51957-13
0019	100711	WSHR LOCK SPLT #4		4.000	96906	MS35338-135
0020	079241TAB	DWG ASSY PANEL REAR HFP		.000	52542	

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0006	117680	LINE CORD 2M 3X16 NEMA5-15P SP		1.000	70903	17502
0007	079246	FAB COVER TOP HFP		1.000	52542	
0008	10063206	PHMS CRES 6-32 * 3/8		1.000	96906	MS51957-28
0009	100647	INT TOOTH #6 CRES		1.000	96906	MS35333-71
0010	100662	FLAT WSHR 6 .146 ID.270 OD CR		1.000	86928	5710-23-10
0011	10073106	PHMS CRES 6-32 X3/8		2.000	96906	MS24673-C26
0012	12304706	PHMS CRES 6-32 X 3/8 BLACK OXI		2.000	96906	MS51957-2BB
0013	11769703	CONN CIRC 3 PIN PLUG Y-KEY		1.000	71468	KPT06B-14-5P-Y

FEATURE 01 LINE VOLT HFP 11/21/86 079270 A-----A 2/10/86

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	07919001	STD 50-60HZ/115VAC		1.000	52542	
0003	07919003	OPT 11 50-60HZ/208VAC		1.000	52542	
0004	07919004	OPT 12 50-60HZ/220VAC		1.000	52542	
0005	07919005	OPT 13 50-60HZ/230VAC		1.000	52542	
0006	07919006	OPT 14 50-60HZ/240VAC		1.000	52542	

STD 50-60HZ/115VAC 11/21/86 07919001 A-----A 5/22/85

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	079190TAB	DWG LINE VOLT HRP SERIES	REF	.000	52542	
0002	119375	CKT BRKR 10A 1P HI INRUSH SERI	CB1	1.000	74193	JA1-A8-A-10-20
0004	10073105	FHMS CRES 6-32 X 5/16		2.000	96906	MS24693-C25
0005	079270TAB	DWG LINE VOLT HFP	REF	.000	52542	

OPT 11 50-60HZ/208VAC 11/21/86 07919003 B15512B 5/22/85

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	079190TAB	DWG LINE VOLT HRP SERIES	REF	.000	52542	
0002	11937402	CKT BRKR 5A 2P HI INRUSH SERIE	CB1	1.000	81541	UPB-11-22191-2
0003	06509603	FOILCAL 208VAC		1.000		
0004	10073105	FHMS CRES 6-32 X 5/16		2.000	96906	MS24693-C25
0005	PHANTOM 5079281	W/L LOOSE LINE VOLTAGE OPTION		1.000	52542	
0006	079270TAB	DWG LINE VOLT HFP	REF	.000	52542	

OPT 12 50-60HZ/220VAC 11/21/86 07919004 B15512B 5/22/85

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	079190TAB	DWG LINE VOLT HRP SERIES	REF	.000	52542	
0002	11937402	CKT BRKR 5A 2P HI INRUSH SERIE	CB1	1.000	81541	UPG-11-22191-2
0003	06509604	FOILCAL 220VAC		1.000		
0004	10073105	FHMS CRES 6-32 X 5/16		2.000	96906	MS24693-C25
0005	PHANTOM 5079281	W/L LOOSE LINE VOLTAGE OPTION		1.000	52542	
0006	079270TAB	DWG LINE VOLT HFP	REF	.000	52542	

OPT 13 50-60HZ/230VAC 11/21/86 07919005 B15512B 5/22/85

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	079190TAB	DWG LINE VOLT HRP SERIES	REF	.000	52542	
0002	11937402	CKT BRKR 5A 2P HI INRUSH SERIE	CB1	1.000	81541	UPG-11-22191-2
0003	06509605	FOILCAL 230VAC		1.000		
0004	10073105	FHMS CRES 6-32 X 5/16		2.000	96906	MS24693-C25
0005	PHANTOM 5079281	W/L LOOSE LINE VOLTAGE OPTION		1.000	52542	
0006	079270TAB	DWG LINE VOLT HFP	REF	.000	52542	

OPT 14 50-60HZ/240VAC 11/21/86 07919006 B15512B 5/22/85

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	079190TAB	DWG LINE VOLT HRP SERIES	REF	.000	52542	
0002	11937402	CKT BRKR 5A 2P HI INRUSH SERIE	CB1	1.000	81541	UPG-11-22191-2
0003	06509606	FOILCAL 240VAC		1.000		
0004	10073105	FHMS CRES 6-32 X 5/16		2.000	96906	MS24693-C25
0005	PHANTOM 5079281	W/L LOOSE LINE VOLTAGE OPTION		1.000	52542	
0006	079270TAB	DWG LINE VOLT HFP	REF	.000	52542	

FEATURE 02 METERING HFP 30 11/21/86 07919106 A-----A 2/10/86

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	07913002	ASSY STD FRONT PNL HFP OPT 01		1.000	52542	
0002	07912906	ASSY PNL FRONT W/MTRS HFP30 OP		1.000	52542	

FEATURE 02 METERING HFP150-3 11/24/86 07919107 A-----A 11/21/86

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	07913002	ASSY STD FRONT PNL HFP OPT 01		1.000	52542	
0002	07912908	ASSY PNL FRONT W/MTRS HFP150-3		1.000	52542	

ASSY STD FRONT PNL HFP OPT 01 11/21/86 07913002 A-----A 2/14/86

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	079130	FAB FRONT PNL W/O MTRS HALF RA		1.000	52542	
0002	11971001	CAPT FASTNR 8-32 .437MTG .125M	REF	.000	94222	51-17-709-24
0003	11971201	HANDLE OVAL 3.50MTG ALUM BLK		1.000	06540	10854-A-0832-2
0004	079152	FAB SPACER BAR FRONT PANEL HRP		1.000	52542	
0005	10074310	PHMS CRES 8-32 X 5/8		2.000	96906	MS24693-C51
0006	07919301	ASSY PCE INDICATOR HALF RACK		1.000	52542	
0007	112608	NYL WSHR FLAT #4.120ID.280OD		1.000	86928	5610-21-62
0008	100703	FLAT WSHR 4 .125 ID.250 OD CR		2.000	96906	MS15795-803
0009	100941	NUT KEP 4-40 .281OD .11THK C		2.000	78189	511-041800-00
0014	07919404	ASSY CABLE FRONT PNL NO-METERS		1.000	52542	

ASSY PNL FRONT W/MTRS HFP30 OP 11/21/86 07912906 A-----A 2/10/86

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	079129	FAB FRONT PANEL W/METERS HRP		1.000	52542	
0002	11971001	CAPT FASTNR 8-32 .437MTG .125M	REF	.000	94222	51-17-709-24
0003	11971201	HANDLE OVAL 3.50MTG ALUM BLK		1.000	06540	10854-A-0832-2
0004	079152	FAB SPACER BAR FRONT PANEL HRP		1.000	52542	
0005	10074310	PHMS CRES 8-32 X 5/8		2.000	96906	MS24693-C51
0006	07919301	ASSY PCB INDICATOR HALF RACK		1.000	52542	
0007	112608	NYL WSHR FLAT #4.120ID.280OD		2.000	86928	5610-21-62
0008	100703	FLAT WSHR 4 .125 ID.250 OD CR		2.000	96906	MS15795-803
0009	100941	NUT KEP 4-40 .2810D .11THK C		2.000	78189	511-041800-00
0010	PHANTOM 07927601	ASSY METER 30VOLT 2WM	M101	1.000	52542	
0011	PHANTOM 07927701	ASSY METER 15AMP 2WM MODUTEC	M102	1.000	52542	
0012	06578405	ASSY PCB METER CAL		1.000	52542	
0013	12305906	PHMS CRES 4-40 X 3/8 BLACK OXI		3.000	96906	MS51957-15B
0014	07919403	ASSY CABLE FRONT PNL W/METERS		1.000	52542	

ASSY PNL FRONT W/MTRS HFP150-3 11/21/86 07912908 A-----A 8/08/86

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	079129	FAB FRONT PANEL W/METERS HRP		1.000	52542	
0002	11971001	CAPT FASTNR 8-32 .437MTG .125M	REF	.000	94222	51-17-709-24
0003	11971201	HANDLE OVAL 3.50MTG ALUM BLK		1.000	06540	10854-A-0832-2
0004	079152	FAB SPACER BAR FRONT PANEL HRP		1.000	52542	
0005	10074310	PHMS CRES 8-32 X 5/8		2.000	96906	MS24693-C51
0006	07919301	ASSY PCB INDICATOR HALF RACK		1.000	52542	
0007	112608	NYL WSHR FLAT #4.120ID.280OD		2.000	86928	5610-21-62
0008	100703	FLAT WSHR 4 .125 ID.250 OD CR		2.000	96906	MS15795-803
0009	100941	NUT KEP 4-40 .2810D .11THK C		2.000	78189	511-041800-00
0010	PHANTOM 07911701	ASSY METER 150V	M101	1.000	52542	
0011	PHANTOM 06539501	ASSY METER SPEC 0-3A	M102	1.000	52542	
0012	06578405	ASSY PCB METER CAL		1.000	52542	
0013	12305906	PHMS CRES 4-40 X 3/8 BLACK OXI		3.000	96906	MS51957-15B
0014	07919403	ASSY CABLE FRONT PNL W/METERS		1.000	52542	

ASSY PNL FRONT W/MTRS HFP150-2 11/21/86 07912907 A-----A 2/10/86

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	079129	FAB FRONT PANEL W/METERS HRF		1.000	52542	
0002	11971001	CAPT FASTNR 8-32 .437MTG .125M	REF	.000	94222	51-17-709-24
0003	11971201	HANDLE OVAL 3.50MTG ALUM BLK		1.000	06540	10854-A-0632-2
0004	079152	FAB SPACER BAR FRONT PANEL HRF		1.000	52542	
0005	10074310	PHMS CRES 8-32 X 5/8		2.000	96906	MS24693-C51
0006	07919301	ASSY PCB INDICATOR HALF RACK		1.000	52542	
0007	112608	NYL WSHR FLAT #4.120ID.280OD		2.000	86928	5610-21-62
0008	100703	FLAT WSHR 4 .125 ID.250 OD CR		2.000	96906	MS15795-803
0009	100941	NUT KEP 4-40 .2810D .11THK C		2.000	78189	511-041800-00
0010	PHANTOM 07911701	ASSY METER 150V	M101	1.000	52542	
0011	PHANTOM 07911801	ASSY METER 2A	M102	1.000	52542	
0012	06578405	ASSY PCB METER CAL		1.000	52542	
0013	12305906	PHMS CRES 4-40 X 3/8 BLACK OXI		3.000	96906	MS51957-15B
0014	07919403	ASSY CABLE FRONT PNL W/METERS		1.000	52542	

FEATURE 3 O/P SWITCHING HFP30- 11/21/86 079271 A-----A 2/10/86

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	07927101	ASSY OPT 01 POL SINGLE HFP 30		1.000	52542	
0002	07927102	ASSY OPT 31 POL DUAL HFP 30		1.000	52542	
0003	07930201	ASSY CABLE OUTPUT DIRECT OPT34		1.000	52542	

FEATURE 03 OUTPUT SWITCHING 11/21/86 079272 1-----1 2/10/86

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	07927201	ASSY OPTION 01 POL SINGLE HFP		1.000	52542	
0002	07927202	ASSY OPT 31 POL DUAL HFP 150		1.000	52542	
0003	07926702	ASSY CABLE OUTPUT DIRECT OPT34		1.000	52542	

ASSY OPT 01 POL SINGLE HFP 30 11/21/86 07927101 A-----A 2/10/8o

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	07904005	ASSY PC RELAY SINGLE-POL EXTER	A3	1.000	52542	
0002	07929301	ASSY BRKT RELAY SINGLE POL HFP		1.000	52542	
0003	07926601	ASSY CABLE OUTPUT HFP30-15		1.000	52542	
0004	079056	FAB PCB SUPPORT		1.000	52542	
0005	100705	FLAT WSHR 8 .187 ID.375 OD CR		2.000	96906	MS15795-807
0006	100940	NUT KEP 8-32 .3750D .16THK C		2.000	78189	511-081B00-00
0007	10063204	PHMS CRES 6-32 * 1/4		2.000	96906	MS51957-26
0008	100647	INT TOOTH #6 CRES		2.000	96906	MS35333-71
0009	100662	FLAT WSHR 6 .146 ID.270 OD CR		2.000	86928	5710-23-10
0010	079271TAB	DWG OUTPUT SWITCHING HFP	REF	.000	52542	
0011	065345	FOILCAL LABEL-CAUTION MERCU		1.000		
0012	07916102	ASSY CABLE P2-P4 HFP		1.000	52542	
0013	079169	FAB INSULATOR CAP BRKT QFP		1.000	52542	

ASSY OPTION 01 POL SINGLE HFP 11/21/86 07927201 3-----3 2/10/86

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	07904001	ASSY PCB RELAY 5A SINGLE-POL	A3	1.000	52542	
0003	07927501	ASSY CABLE OUTPUT STD HFP150		1.000	52542	
0004	079056	FAB PCB SUPPORT		1.000	52542	
0005	100705	FLAT WSHR 8 .187 ID.375 OD CR		2.000	96906	MS15795-807
0006	100940	NUT KEP 8-32 .3750D .16THK C		2.000	78189	511-081B00-00
0007	10063204	PHMS CRES 6-32 * 1/4		2.000	96906	MS51957-26
0008	100647	INT TOOTH #6 CRES		2.000	96906	MS35333-71
0009	100662	FLAT WSHR 6 .146 ID.270 OD CR		2.000	86928	5710-23-10
0010	079272TAB	DWG OUTPUT SWITCHING HFP	REF	.000	52542	
0011	065345	FOILCAL LABEL-CAUTION MERCU		1.000		
0012	07916102	ASSY CABLE P2-P4 HFP		1.000	52542	

ASSY OPT 31 POL DUAL HFP 30 11/21/86 07927102 A-----A 2/10/86

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	07904006	ASSY PC RELAY DUAL-POL EXTERNA	A3	1.000	52542	
0002	07929302	ASSY BRKT RELAY DUAL POL HFP		1.000	52542	
0003	07926601	ASSY CABLE OUTPUT HFP30-15		1.000	52542	
0004	079056	FAB PCB SUPPORT		1.000	52542	
0005	100705	FLAT WSHR 8 .187 ID.375 OD CR		2.000	96906	MS15795-807
0006	100940	NUT KEP 8-32 .3750D .16THK C		2.000	78189	511-081800-00
0007	10063204	PHMS CRES 6-32 * 1/4		2.000	96906	MS51957-26
0008	100647	INT TOOTH #6 CRES		2.000	96906	MS35333-71
0009	100662	FLAT WSHR 6 .146 ID.270 OD CR		2.000	86928	5710-23-10
0010	079271TAB	DWG OUTPUT SWITCHING HFP	REF	.000	52542	
0011	065345	FOILCAL LABEL-CAUTION MERCU		1.000		
0012	07916102	ASSY CABLE P2-P4 HFP		1.000	52542	
0013	079169	FAB INSULATOR CAP BRKT OFP		1.000	52542	

ASSY OPT 31 POL DUAL HFP 150 11/21/86 07927202 A-----A 2/10/86

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	07904002	ASSY PCB RELAY 5A DUAL POLARIT	A3	1.000	52542	
0003	07927501	ASSY CABLE OUTPUT STD HFP150		1.000	52542	
0004	079056	FAB PCB SUPPORT		1.000	52542	
0005	100705	FLAT WSHR 8 .187 ID.375 OD CR		2.000	96906	MS15795-807
0006	100940	NUT KEP 8-32 .3750D .16THK C		2.000	78189	511-081800-00
0007	10063204	PHMS CRES 6-32 * 1/4		2.000	96906	MS51957-26
0008	100647	INT TOOTH #6 CRES		2.000	96906	MS35333-71
0009	100662	FLAT WSHR 6 .146 ID.270 OD CR		2.000	86928	5710-23-10
0010	079272TAB	DWG OUTPUT SWITCHING HFP	REF	.000	52542	
0011	065345	FOILCAL LABEL-CAUTION MERCU		1.000		
0012	07916102	ASSY CABLE P2-P4 HFP		1.000	52542	

ASSY CABLE OUTPUT DIRECT OPT34 11/21/86 07930201 A-----A 4/28/86

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	123268	CONN CIRC 7 SKT #12 BOX MT RCP	J3	1.000	96906	MS3102A20-15S
0002	100176	CAP CER DP 1UF 50V 20% Z5U .38	C6	1.000	56289	2G37Z5U105M050B
0003	11972901	CON RTNGLR 12POS RECEPT SHELL	P2	1.000	27264	22-01-2125
0004	11958201	CONN TERM SKT 22-30 CRIMP AU D		4.000	27264	08-56-0110
0005	123095	TERMINAL RING 10 CRMP 22-16 RE		2.000	14726	R4149SFT
0007	117808	TERMINAL RING 6 CRMP 12-10 NC		2.000	98410	C-136-06
0009	PHANTOM 507930201	W/L CABLE OUTPUT NO POL HFP36-		1.000	52542	
0010	123122	TERMINAL RING 1/4 CRMP 2 RED 1		1.000	98410	D-650-14X
0011	079302TAB	DWG ASSY CABLE OUTPUT DIRECT	REF	.000	52542	

ASSY CABLE OUTPUT DIRECT OPT34 11/21/86 07926702 A-----A 2/10/86

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	11769803	CONN CIRC 9SKT RCPT Y-KEY	J3	1.000	71468	KPT00A-14-5S-Y
0003	11972901	CON RTNGLR 12POS RECEPT SHELL	P2	1.000	27264	22-01-2125
0004	11958201	CONN TERM SKT 22-30 CRIMP AU D		4.000	27264	08-56-0110
0005	123095	TERMINAL RING 10 CRMP 22-16 RE		3.000	14726	R4149SFT
0007	123097	TERMINAL RING 6 CRMP 22-16 RED		1.000	14726	R4147SFT
0009	PHANTOM 507926702	W/L CABLE OUTPUT DIRECT OPT 34		1.000	52542	
0010	079267TAB	DWG ASSY CABLE OUTPUT DIRECT	REF	.000	52542	
0011	100075	CAP C DISC.01UF 500V	C7	1.000	91418	B-GP

ASSY PCB INDICATOR HALF RACK 11/21/86 07917301 A-----A 5/22/85

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	079193	FAB PCB INDICATOR HALF RACK		1.000	52542	
0003	100482	TERM SWAGEBIFUR .062MAT.16HI.0		5.000	88245	2000B-1
0004	123362	LED GRN HLMP3507 12MCD@20MA .2	DS1	1.000	28480	HLMP-3507
0005	103201	LED ORANGE MV5153 6MCD@20MA 63	DS2	1.000	50522	MV5153
0006	123363	LED YEL HLMP3400 4MCD@10MA .2D	DS3	1.000	28480	HLMP-3400
0007	117227	LED RED DMD5753 9MCD@20MA .2D*	DS4	1.000	71744	DMD5753

ASSY PCB METER CAL 11/21/86 06578405 A-----A 2/10/86

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	06578301	FAB PCB METER CAL		1.000	52542	
0002	123203	SPCR SWAGE 4-40 .44L X.25RND		3.000	06540	9536D-A-0440
0003	100482	TERM SWAGEBIFUR .062MAT.16HI.0		3.000	88245	2000B-1
0004	106328	RES MF 9.53K .12W 1% 100PPM	R101	1.000	91637	CMF-60 TI
0005	102473	POT 15T PC 5K 10% 3/8W CERM E	R102	1.000	73138	89PR5K
0006	102183	POT 15T PC500 10% 3/8W CERM E	R103	1.000	73138	89PR500
0007	06578201	ARTWORK PCB METER CAL	REF	.000	52542	
0008	123283	FLAT WSHR #10 .194ID.3120D.03T		3.000		BY DESCRIPTION

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	079040	FAB PCB RELAY		1.000	52542	
0002	123280	CON 1CCT PC PIN .230W .032TH	1,3	2.000	79963	836
0003	123279	CON 1CCT PC PIN .187W .032TH	2,4	2.000	79963	894
0005	117570	CAP CER DP .01 UF 100V 20% X7R	C1,9	2.000	04222	SR201C103MAA
0006	99REF50	*** REF DESN'TORS NOT USED ***	C2	.000		
0007	100176	CAP CER DP 1UF 50V 20% Z5U .38	C3	1.000	56289	2C37Z5U105M050B
0008	100178	CAP CER DP .1UF 50V 20% Z5U .3	C4,6	2.000	56289	2C37Z5U104M050B
0009	103383	CAP EL AX 470UF-10/+50% 35V .5	C5	1.000	74840	477TTA35A
0011	99REF50	*** REF DESN'TORS NOT USED ***	C7,8,10	.000		
0015	100385	DIODE SIG 1N4151 50V	CR1	1.000	03508	1N4151
0016	100413	DIODE RECT1N5395 400V 1.5A.26L	CR2	1.000	04713	1N5395
0017	99REF50	*** REF DESN'TORS NOT USED ***	CR3,4	.000		
0019	123219	CON PC PIN 3 STR HDR .1C-C FRI	J1	1.000	27264	22-11-2032
0020	123220	CON PC PIN 10 STR HDR .1C-C FR	J2	1.000	27264	22-11-2102
0022	119795	RELAY REED 24V 2FA HG 725R NO	K1	1.000	95348	6522A-241-5
0023	99REF86	WIRE JUMPER	K2	2.000	52542	
0024	99REF50	*** REF DESN'TORS NOT USED ***	K3,4	.000		
0026	106616	XSTR SIPNPMPSA14 30V B>10K@10M	Q1,2	2.000	04713	MPSA14
0028	99REF50	*** REF DESN'TORS NOT USED ***	Q3,4	.000		
0030	116201	RES CC 1/8W 130K 5%	R1	1.000	01121	BB1345
0031	101711	RES CC1/8W1.0K 5%	R2	1.000	01121	BB1025
0032	101697	RES CC1/8W 10K 5%	R3,4,6	3.000	01121	BB1035
0034	102879	JUMPER, 22AWG INSULATED .09D	R5,12	2.000	55210	L-2007-1
0036	101694	RES CC1/8W 47K 5%	R7	1.000	01121	BB4735
0037	101952	RES CC 1/8W 27K 5%	R8	1.000	01121	BB2735
0038	99REF50	*** REF DESN'TORS NOT USED ***	R9,10	.000		
0040	101792	RES CC1/8W4.7K 5%	R11	1.000	01121	BB4725
0041	117571	RES MF 11.5 .12W 1% 100PPM	R13	1.000		C=RN60D11R5F
0042	117345	CON 1 CTPCPIN .04D .35L>.05MTG	TP1	1.000	06776	CP-92-3
0044	11979601	IC CMOS 74HC266 QUAD EXCL NOR	U1	1.000	27014	MM74HC266
0045	116948	IC CMOS 14538 2*MONOMJLIVIB	U2	1.000	04713	MC14538BCP
0046	99REF50	*** REF DESN'TORS NOT USED ***	U3	.000		
0047	045283	IC CMOS 4001 QUAD-2IN NOR GA	U4	1.000	04713	MC14001BCP
0048	117101	IC VOLTREG78L05 5V 5% <.4W@75C	U5	1.000	04713	MC78L05ACP
0049	117530	OPTOISOLTR4N37 IC/IF>1 1KV <10	U6	1.000		4N37
0051	99REF86	WIRE JUMPER	W1,2	2.000	52542	
0060	707904005	SCHEM RELAY BD EXT RELAY NO PO	REF	.000	52542	

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	079040	FAB PCB RELAY		1.000	52542	
0002	123280	CON 1CCT PC PIN .250W .032TH	1,3	2.000	79963	836
0003	123279	CON 1CCT PC PIN .187W .032TH	2,4	2.000	79963	894
0005	117570	CAP CER DP .01 UF 100V 20% X7R	C1,2,9	4.000	04222	SR201C103MAA
0006	99REF01	*** REF DESIG CONT FROM ABOVE	C10	.000		
0007	100176	CAP CER DP 1UF 50V 20% Z5U .38	C3,4	2.000	56289	2C37Z5U105M050B
0009	103383	CAP EL AX 470UF-10/+50% 35V .5	C5	1.000	74840	477TTA35A
0010	100178	CAP CER DP .1UF 50V 20% Z5U .3	C6	1.000	56289	2C37Z5U104M050B
0011	99REF50	*** REF DESN'TORS NOT USED ***	C7,8	.000		
0015	100385	DIODE SIG 1N4151 50V	CR1,3	2.000	03508	1N4151
0016	100413	DIODE RECT1N5395 400V 1.5A.26L	CR2,4	2.000	04713	1N5395
0019	123219	CON PC PIN 3 STR HDR .1C-C FRI	J1	1.000	27264	22-11-2032
0020	123220	CON PC PIN 10 STR HDR .1C-C FR	J2	1.000	27264	22-11-2102
0022	119795	RELAY REED 24V 2FA HG 725R NO	K1,3	2.000	95348	6522A-241-5
0023	99REF86	WIRE JUMPER	K2,4	4.000	52542	
0026	106616	XSTR SIPNPMPSA14 30V B>10K@10M	Q1-4	4.000	04713	MPSA14
0030	116201	RES CC 1/8W 130K 5%	R1	1.000	01121	BB1345
0031	101711	RES CC1/8W1.0K 5%	R2,5	2.000	01121	BB1025
0032	101697	RES CC1/8W 10K 5%	R3,4	2.000	01121	BB1035
0035	101790	RES CC 62K 1/8W 5%	R6	1.000	01121	BB6235
0036	101694	RES CC1/8W 47K 5%	R7,9	2.000	01121	BB4735
0037	101952	RES CC 1/8W 27K 5%	R8,10	2.000	01121	BB2735
0040	101792	RES CC1/8W4.7K 5%	R11,12	2.000	01121	BB4725
0041	117571	RES MF 11.5 .12W 1% 100PPM	R13	1.000		C=RN60D11R5F
0042	117345	CON 1 CTPCPIN .04D .35L>.05MTG	TP1	1.000	06776	CP-92-3
0044	11979601	IC CMOS 74HC266 QUAD EXCL NOR	U1	1.000	27014	MM74HC266
0045	116948	IC CMOS 14538 2*MONOMULIVIB	U2	1.000	04713	MC14538BCP
0046	103937	IC CMOS SS4011 4 2IN NAND 14DI	U3	1.000	04713	MC14011BCP
0047	045283	IC CMOS 4001 QUAD-2IN NOR GA	U4	1.000	04713	MC14001BCP
0048	117101	IC VOLTREG78L05 5V 5% <.4W@75C	U5	1.000	04713	MC78L05ACP
0049	117530	OPTOISOLTR4N37 IC/IF>1 1KV <10	U6	1.000		4N37
0050	99REF50	*** REF DESN'TORS NOT USED ***	W1,2	.000		
0060	707904006	SCHEM RELAY BD EXT RELAYS W/PD	REF	.000	52542	

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFR PART NUMBER
0001	079040	FAB PCB RELAY		1.000	52542	
0002	123280	CON ICCT PC PIN .250W .032TH	1,3	2.000	79963	836
0003	123279	CON ICCT PC PIN .187W .032TH	2,4	2.000	79963	894
0005	117570	CAP CER DP .01 UF 100V 20% X7R	C1,9	2.000	04222	SR201C103MAA
0006	99REF50	*** REF DESN'TORS NOT USED ***	C2	.000		
0007	100178	CAP CER DP .1UF 50V 20% Z5U .3	C3,4,6	3.000	56289	2C3Z5U104M050B
0009	103383	CAP EL AX 470UF-10/+50% 35V .5	C5	1.000	74840	477TTA35A
0011	99REF50	*** REF DESN'TORS NOT USED ***	C7,8,10	.000		
0015	100385	DIODE SIG 1N4151 50V	CR1,2	2.000	03508	1N4151
0017	99REF50	*** REF DESN'TORS NOT USED ***	CR3,4	.000		
0019	123219	CON PC PIN 3 STR HDR .1C-C FRI	J1	1.000	27264	22-11-2032
0020	123220	CON PC PIN 10 STR HDR .1C-C FR	J2	1.000	27264	22-11-2102
0022	119795	RELAY REED 24V 2FA HG 725R NO	K1	1.000	95348	6522A-241-5
0023	123221	RELAY REED 24V 2FC HG 5A CARRY	K2	1.000	71482	HGR2M51111ND0
0024	99REF50	*** REF DESN'TORS NOT USED ***	K3,4	.000		
0026	106616	XSTR SIPNPMPSA14 30V B>10K@10M	Q1,2	2.000	04713	MPSA14
0028	99REF50	*** REF DESN'TORS NOT USED ***	Q3,4	.000		
0030	101976	RES CC1/8W100K 5%	R1	1.000	01121	BB1045
0031	101711	RES CC1/8W1.0K 5%	R2	1.000	01121	BB1025
0032	101697	RES CC1/8W 10K 5%	R3,4	2.000	01121	BB1035
0034	102879	JUMPER, 22AWG INSULATED .09D	R5,12	2.000	55210	L-2007-1
0035	101694	RES CC1/8W 47K 5%	R6-8	3.000	01121	BB4735
0038	99REF50	*** REF DESN'TORS NOT USED ***	R9,10,13	.000		
0040	101792	RES CC1/8W4.7K 5%	R11	1.000	01121	BB4725
0042	117345	CON 1 CTPCPIN .04D .35L>.05MTS	TP1	1.000	06776	CP-92-3
0044	11979601	IC CMOS 74HC266 QUAD EXCL NOR	U1	1.000	27014	MM74HC266
0045	116948	IC CMOS 14538 2*MONOMULIVIB	U2	1.000	04713	MC1453BBCP
0046	99REF50	*** REF DESN'TORS NOT USED ***	U3	.000		
0047	045283	IC CMOS 4001 QUAD-2IN NOR GA	U4	1.000	04713	MC14001BCP
0048	117101	IC VOLTRE678L05 5V 5% <.4W@75C	U5	1.000	04713	MC78L05ACP
0049	117530	OPTOISOLTR4N37 IC/IF>1 1KV <10	U6	1.000		4N37
0050	102879	JUMPER, 22AWG INSULATED .09D	W1,2	2.000	55210	L-2007-1
0060	707904001	SCHEM RELAY BD NO POLARITY	REF	.000	52542	

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	079040	FAB PCB RELAY		1.000	52542	
0002	123280	CON 1CCT PC PIN .250W .032TH	1,3	2.000	79963	836
0003	123279	CON 1CCT PC PIN .187W .032TH	2,4	2.000	79963	894
0005	117570	CAP CER DP .01 UF 100V 20% X7R	C1,2,9	4.000	04222	SR201C103MAA
0005	99REF01	*** REF DESIG CONT FROM ABOVE	C10	.000		
0007	100178	CAP CER DP .1UF 50V 20% Z5U .3	C3,4,6	3.000	56289	2C37Z5U104M050B
0009	103383	CAP EL AX 470UF-10/+50% 35V .5	C5	1.000	74840	477TTA35A
0011	99REF50	*** REF DESN'TORS NOT USED ***	C7,8	.000		
0015	100385	DIODE SIG 1N4151 50V	CR1-4	4.000	03508	1N4151
0019	123219	CON PC PIN 3 STR HDR .1C-C FRI	J1	1.000	27264	22-11-2032
0020	123220	CON PC PIN 10 STR HDR .1C-C FR	J2	1.000	27264	22-11-2102
0022	119795	RELAY REED 24V 2FA HG 725R ND	K1,3	2.000	95348	6522A-241-5
0023	123221	RELAY REED 24V 2FC HG 5A CARRY	K2,4	2.000	71482	HGR2M51111N00
0026	106616	XSTR SIPNPMPSA14 30V B>10K@10M	Q1-4	4.000	04713	MPSA14
0030	101976	RES CC1/8W100K 5%	R1	1.000	01121	BB1045
0031	101711	RES CC1/8W1.0K 5%	R2,5	2.000	01121	BB1025
0032	101697	RES CC1/8W 10K 5%	R3,4	2.000	01121	BB1035
0035	101694	RES CC1/8W 47K 5%	R6-10	5.000	01121	BB4735
0040	101792	RES CC1/8W4.7K 5%	R11,12	2.000	01121	BB4725
0041	99REF50	*** REF DESN'TORS NOT USED ***	R13	.000		
0042	117345	CON 1 CTPCPIN .04D .35L>.05MTG	TP1	1.000	06776	DP-92-3
0044	11979601	IC CMOS 74HC266 QUAD EXCL NOR	U1	1.000	27014	MM74HC266
0045	116948	IC CMOS 14538 2*MONOMULIVIB	U2	1.000	04713	MC14538BCP
0046	103937	IC CMOS SS4011 4 2IN NAND 14DI	U3	1.000	04713	MC14011BCP
0047	045283	IC CMOS 4001 QUAD-2IN NOR GA	U4	1.000	04713	MC14001BCP
0048	117101	IC VOLTREG78L05 5V 5% <.4W@75C	U5	1.000	04713	MC78L05ACP
0049	117530	OPTOISOLTR4N37 IC/IF>1 1KV <10	U6	1.000		4N37
0050	99REF50	*** REF DESN'TORS NOT USED ***	W1,2	.000		
0060	707904002	SCHEM RELAY BD W/POLARITY	REF	.000	52542	

ASSY BRKT RELAY SINGLE POL HFP 11/21/86 07929301 A-----A 4/03/86

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	079126	FAB BRKT RELAY HRP		1.000	52542	
0002	123269	RELAY HG 24VDC 20A 2FA 144 OHM	K1	1.000	73674	AFM220-310
0003	10064208	PHMS CRES 8-32 X 1/2		2.000	96906	MS51957-45
0004	100705	FLAT WSHR 8 .187 ID.375 OD CR		4.000	96906	MS15795-807
0005	100940	NUT KEP 8-32 .3750D .16THK C		2.000	78189	511-081800-00
0007	123415	TRMNL SLIPON.25FEM TO DBL MALE		2.000	14726	43B
0009	07929401	ASSY CABLE RELAY SINGLE HFP		1.000	52542	
0010	079293TAB	DWG ASSY BRKT RELAY SNGL/DUAL	REF	.000	52542	
0011	079294TAB	DWG ASSY CABLE RELAY HFP	REF	.000	52542	
0012	507929401	W/L CABLE RELAY SINGLE HFP		1.000	52542	

ASSY BRKT RELAY DUAL POL HFP 11/21/86 07929302 A-----A 4/03/86

INSTRUMENT DIV 52542 1

FIND	SD P/N	DESCRIPTION	REFERENCE	QUANT	FSCM	MFG PART NUMBER
0001	079126	FAB BRKT RELAY HRP		1.000	52542	
0002	123269	RELAY HG 24VDC 20A 2FA 144 OHM	K1,2	2.000	73674	AFM220-310
0003	10064208	PHMS CRES 8-32 X 1/2		2.000	96906	MS51957-45
0004	100705	FLAT WSHR 8 .187 ID.375 OD CR		4.000	96906	MS15795-807
0005	100940	NUT KEP 8-32 .3750D .16THK C		2.000	78189	511-081800-00
0007	123415	TRMNL SLIPON.25FEM TO DBL MALE		6.000	14726	43B
0008	07929402	ASSY CABLE RELAY DUAL HFP		1.000	52542	
0009	079293TAB	DWG ASSY BRKT RELAY SNGL/DUAL	REF	.000	52542	
0010	079294TAB	DWG ASSY CABLE RELAY HFP	REF	.000	52542	
0011	PHANTOM 507929402	W/L CABLE RELAY DUAL HFP		1.000	52542	

CHAPTER 6

DRAWINGS

6-1. INTRODUCTION

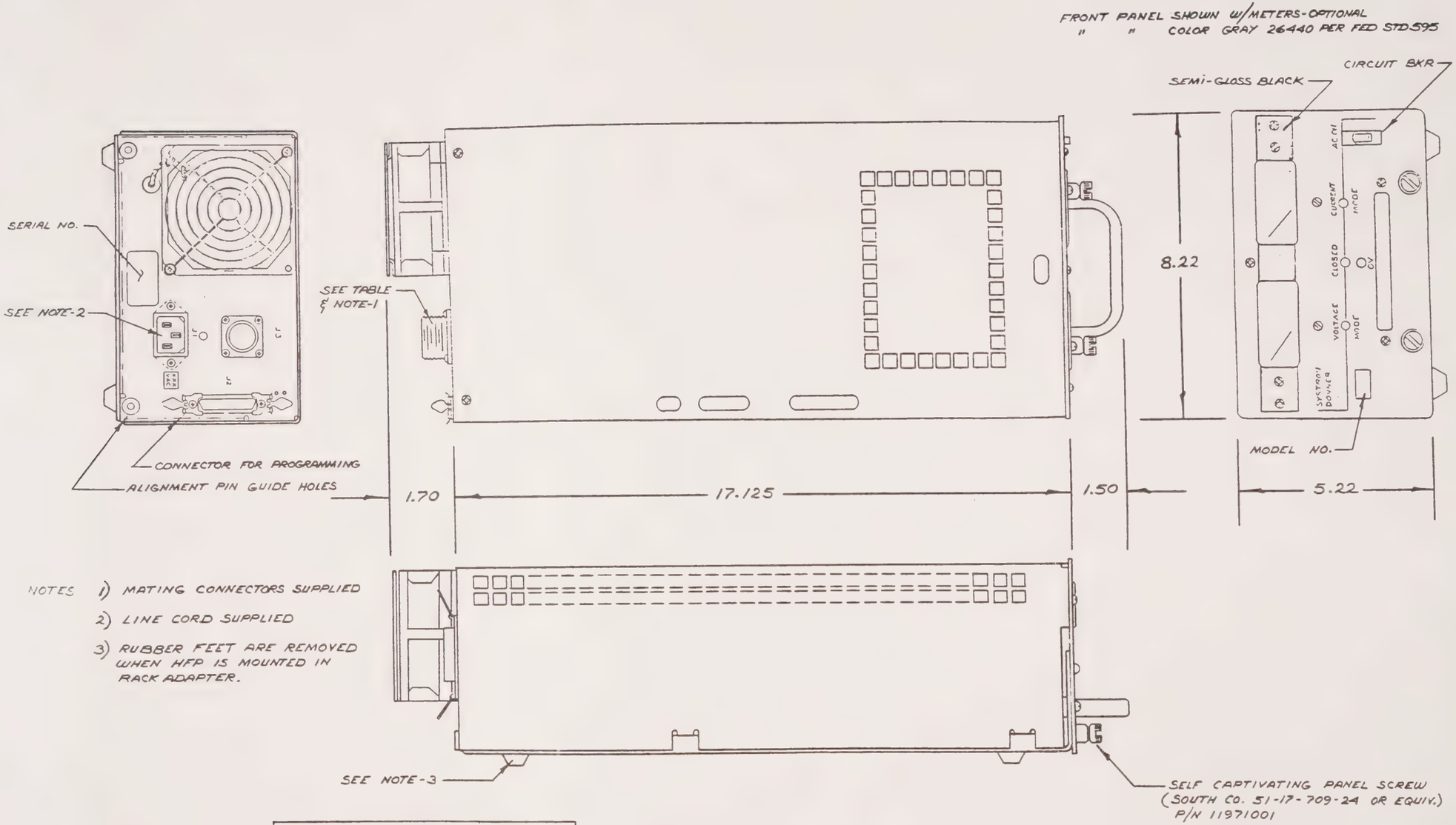
6-2. This chapter contains the assembly and schematic diagrams for the HFP Series Power Supplies. Table 6-1 provides a list by figure number of the drawings, with title, drawing number and manual page number. Table 6-2 provides a list by figure number of the schematics contained in this chapter.

Table 6-1. Assembly Drawings

Figure No.	Title	Drawing No.	Rev No.	Page No.
6-1	Outline, HFP Series	079 251	1	6-3
6-2	Assembly Shipping, HFP 150	079 248 TAB	A	6-5
6-3	Assembly Shipping, HFP 30	079 251 TAB	1	6-7
6-4	Assembly Test — HFP Series (Sheet 1 of 2)	079 237 TAB	A	6-9
6-4	Assembly Test — HFP Series (Sheet 2 of 2)	079 237 TAB	A	6-11
6-5	Control PCB	065 829 TAB	G3	6-13
6-6	Indicator PCB	079 193 01	A	6-15
6-7	Meter Cal PCB	065 784 TAB	A	6-17
6-8	Relay PCB	079 040 TAB	A	6-19
6-9	Series Pass PCB Left HFP (Sheet 1 of 2)	079 236 TAB	A	6-21
6-9	Series Pass PCB Rt HFP (Sheet 2 of 2)	079 236 TAB	A	6-23
6-10	Series Pass PCB Rt HFP 150-2	079 236 03	A	6-25
6-11	Series Pass PCB Left HFP 150-2	079 236 04	A	6-27
6-12	Switch Control PCB	079 235 TAB	A	6-29
6-13	Heat Sink (Sheet 1 of 2)	079 249 TAB	A	6-31
6-13	Heat Sink (Sheet 2 of 2)	079 249 TAB	A	6-33
6-14	Heat Sink Support Assembly HFP 30	079 239 01	A	6-35
6-15	Heat Sink Support Assembly HFP 150	079 239 02	B	6-37
6-16	Heat Sink Top Assembly	079 263 TAB	A	6-39
6-17	Front Panel Assembly w/Meters	079 129 TAB	A	6-41
6-18	Rear Panel Assembly HFP 30	079 278 TAB	A	6-43
6-19	Rear Panel Assembly HFP 150	079 241 TAB	A	6-45
6-20	Line Voltage Options	079 270 TAB	A	6-47
6-21	Output Switching HFP 30 (Sheet 1 of 2)	079 271 TAB	A	6-49
6-21	Output Switching HFP 30 (Sheet 2 of 2)	079 271 TAB	A	6-51
6-22	Output Switching HFP 150	079 272 TAB	A	6-53

Table 6-2. Schematics

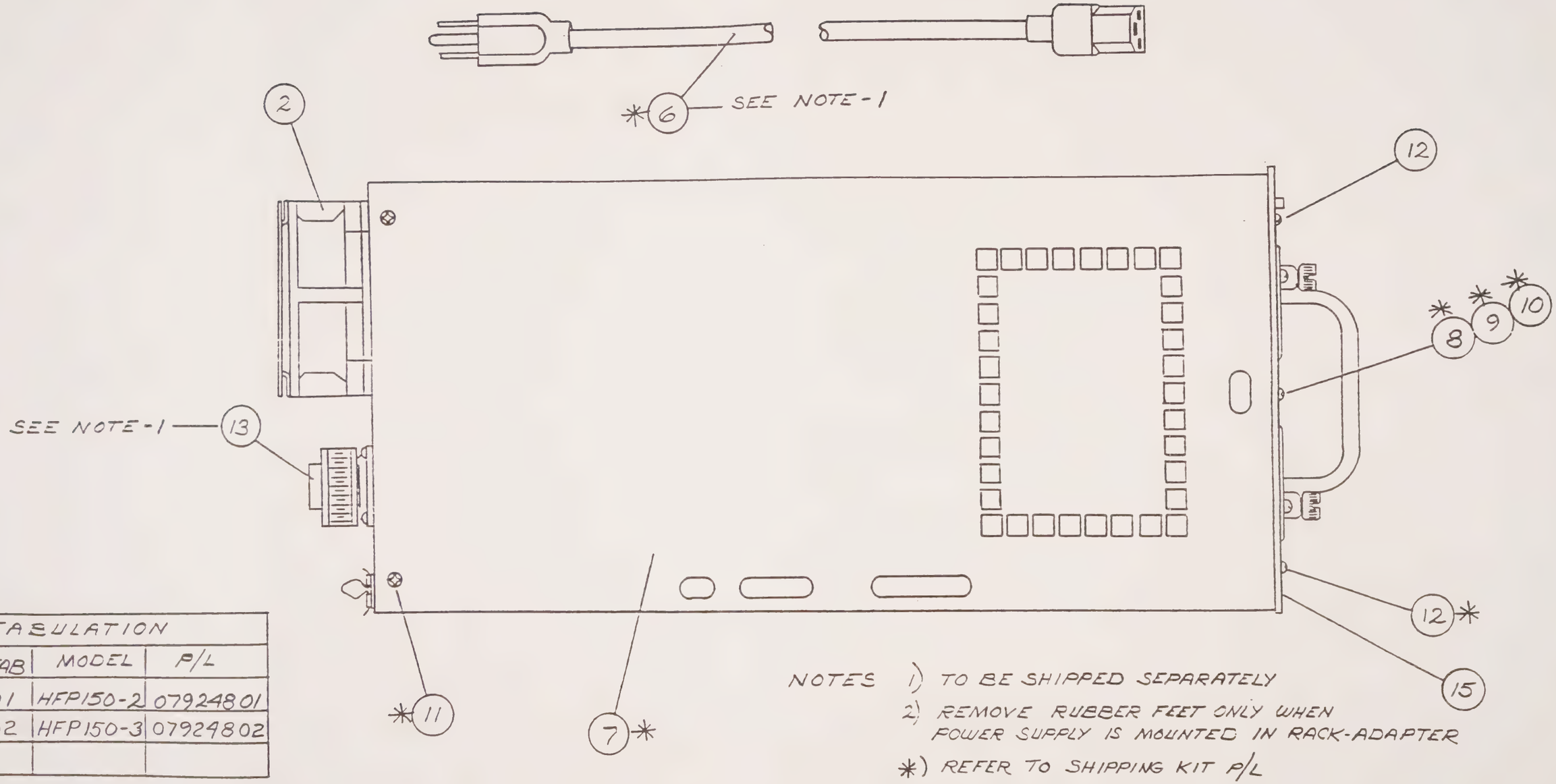
Figure No.	Title	Drawing No.	Rev No.	Page No.
6-23	HFP 30-15	7-079 251 01	A	6-55
6-24	HFP 150-2	7-079 248 01	A	6-57
6-25	HFP 150-3	7-079 248 02	A	6-59
6-26	Relay Card, Single Polarity	7-079 040 01	A	6-61
6-27	Relay Card, Dual Polarity	7-079 040 02	A	6-63
6-28	Relay Card, Ext. Relay, Single Polarity	7-079 040 05	A	6-65
6-29	Relay Card, Ext. Relay, Dual Polarity	7-079 040 06	A	6-67
6-30	Switch Control PCB	7-079 235 TAB	A	6-69



NOTES
1) MATING CONNECTORS SUPPLIED
2) LINE CORD SUPPLIED
3) RUBBER FEET ARE REMOVED WHEN HFP IS MOUNTED IN RACK ADAPTER.

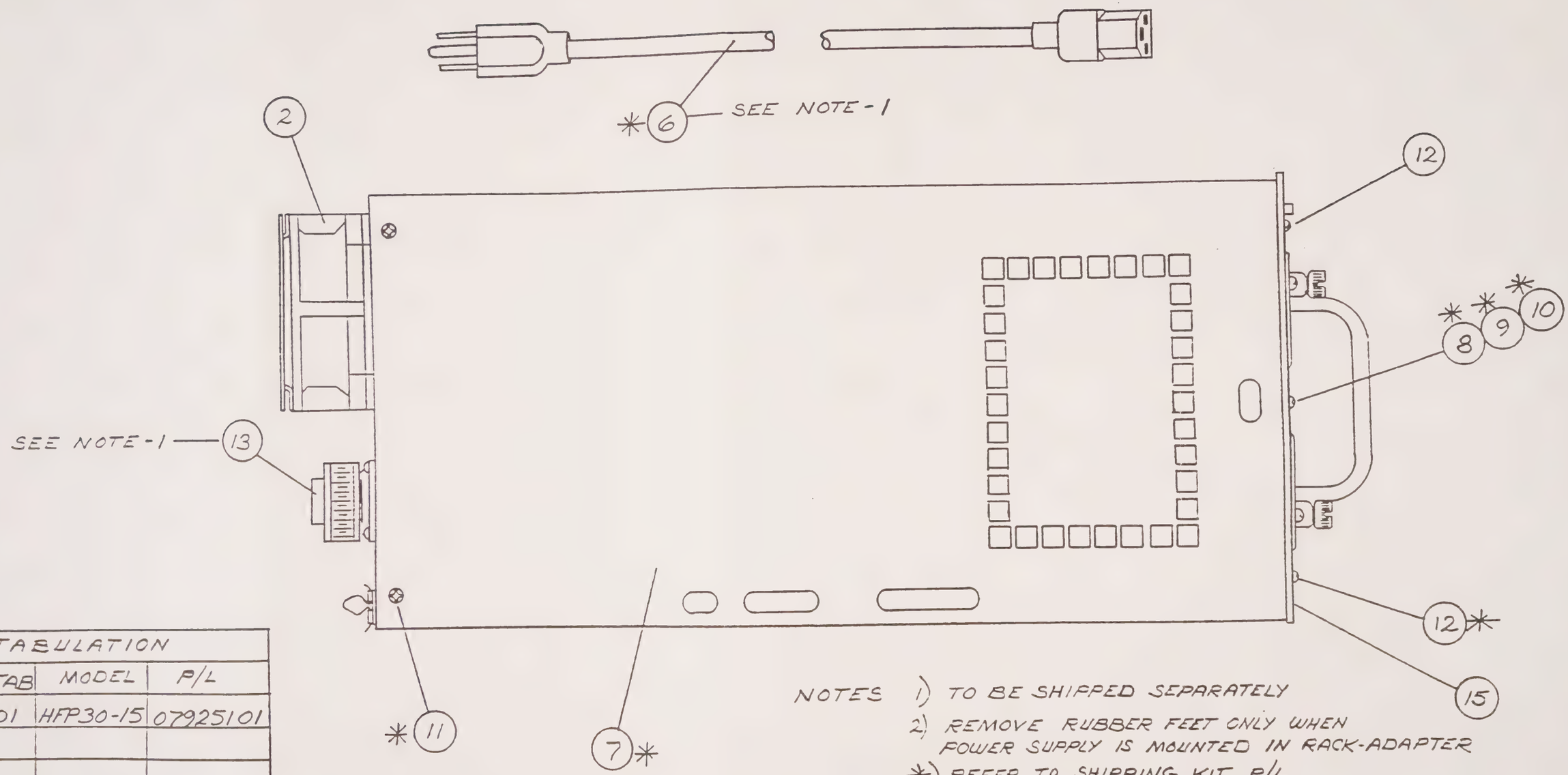
TABLE	
MODEL	J3 OUTPUT CONNECTOR
HFP30-15	MS3102A-20-15S
1150-2	KPT00A-14-5S-Y

Figure 6-1.
Outline HFP Series
0079251 REV 1



TABULATION		
079248TAB	MODEL	P/L
01	HFP150-2	07924801
02	HFP150-3	07924802

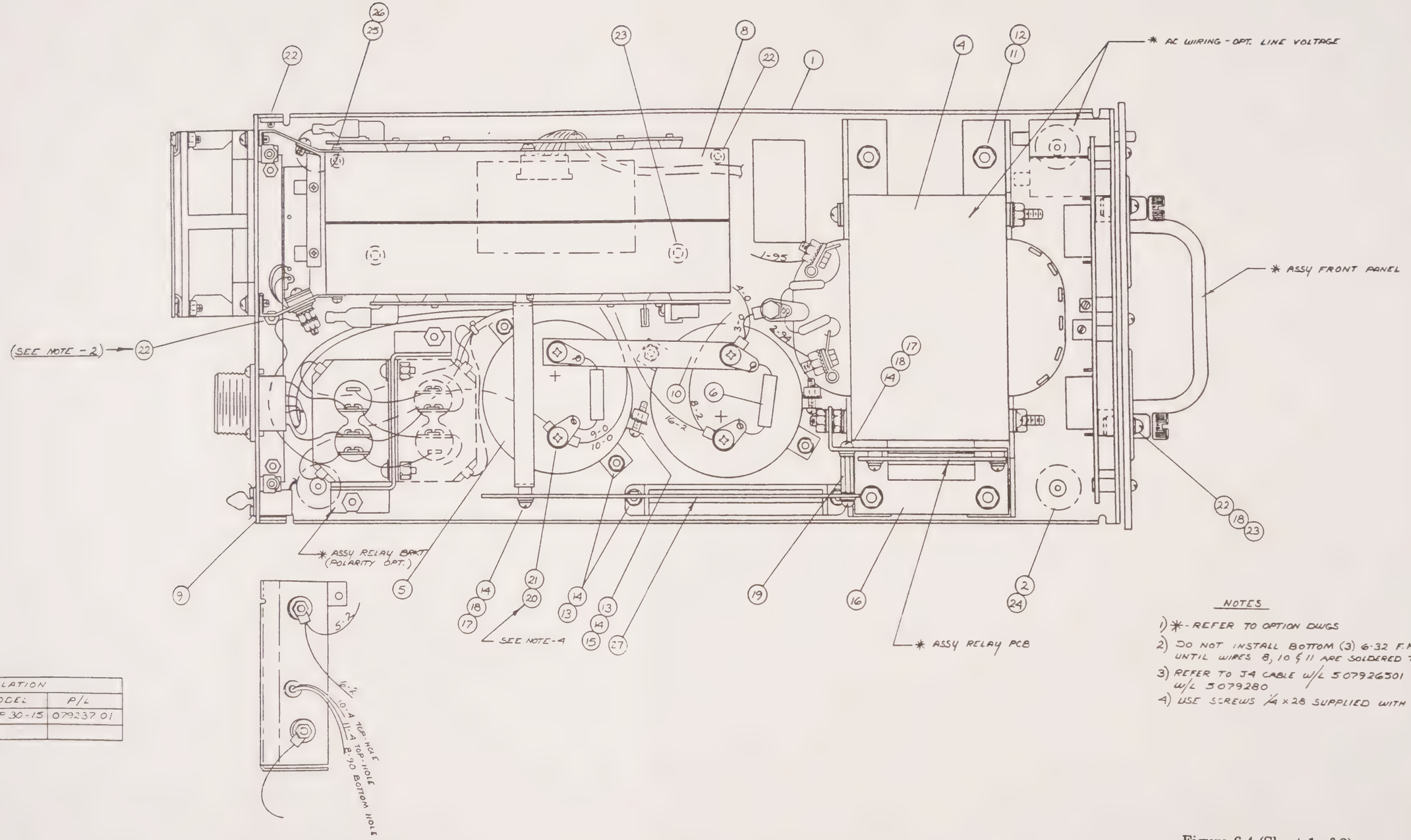
Figure 6-2.
Shipping Assembly, HFP 150
079248 TAB REV A



TABULATION		
079251 TAB	MODEL	P/L
01	HFP30-15	07925101

NOTES 1) TO BE SHIPPED SEPARATELY
2) REMOVE RUBBER FEET ONLY WHEN POWER SUPPLY IS MOUNTED IN RACK-ADAPTER
*) REFER TO SHIPPING KIT P/L

Figure 6-3
Shipping Assembly, HFP 30
079251 TAB REV 1

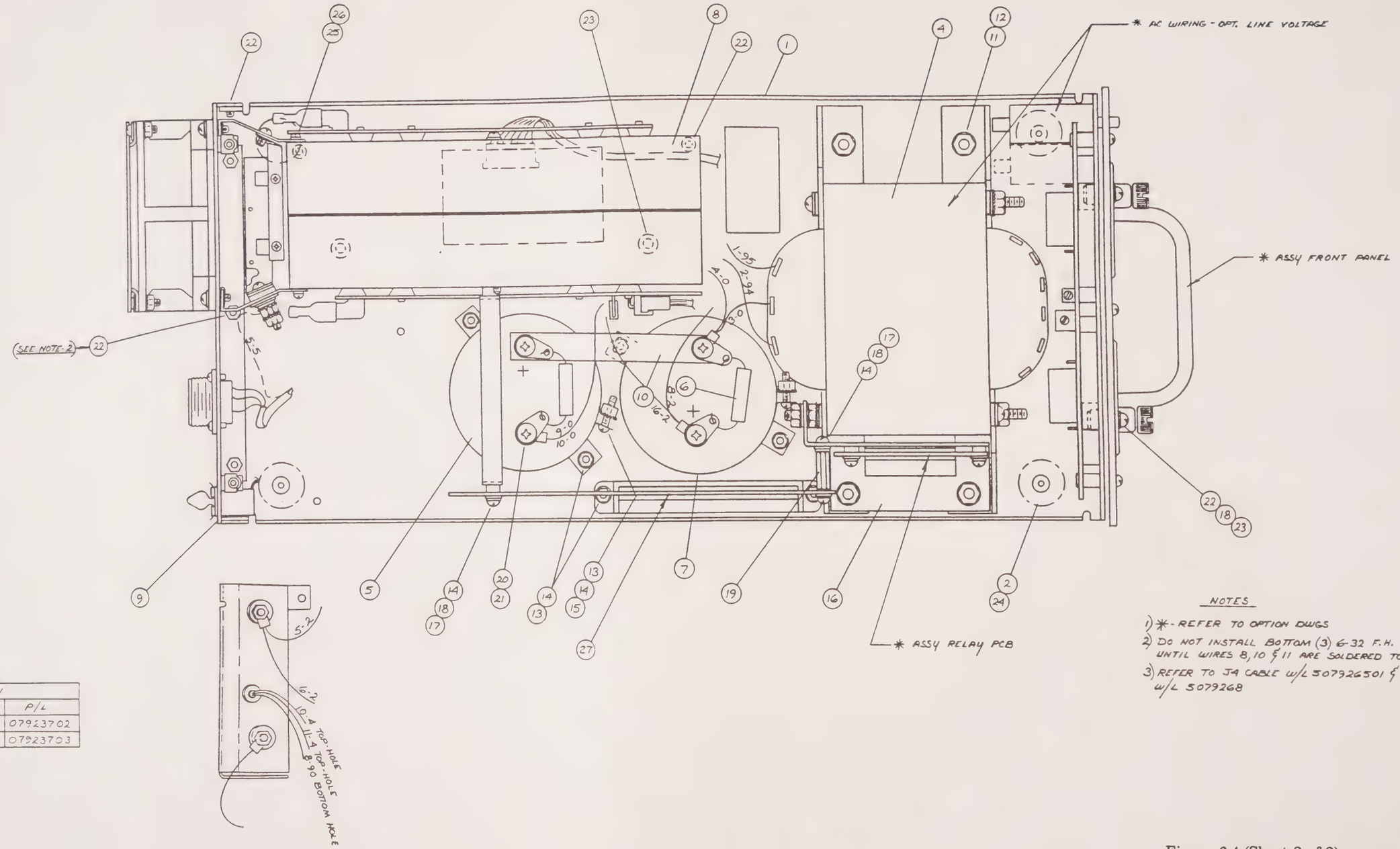


TABULATION			
079237 TAB	MODEL	P/L	
01	HFP 30-15	079237 01	

NOTES

1) * - REFER TO OPTION DWGS
2) DO NOT INSTALL BOTTOM (3) 6-32 F.H. SCREWS UNTIL WIRES 8, 10 & 11 ARE SOLDERED TO SHUNT
3) REFER TO J4 CABLE W/L 5079263-01 & LOOSE W/L 3079280
4) USE SCREWS 1/4 x 28 SUPPLIED WITH CAPS.

Figure 6-4 (Sheet 1 of 2)
Test Assembly
079237 TAB REV A



TABULATION		
079237 TAB	MODEL	P/L
02	HFP150-2	07923702
03	150-3	07923703

Figure 6-4 (Sheet 2 of 2)
Test Assembly
079237 TAB REV A

PARTS LIST	MODEL
065829 01	HFP500-1
02	HRP 60-7
03	36-10
04	200-.7
05	16-2
06	QFP 6-12
07	16-7
08	26-5
09	36-4
10	60-2.5
11	75-2

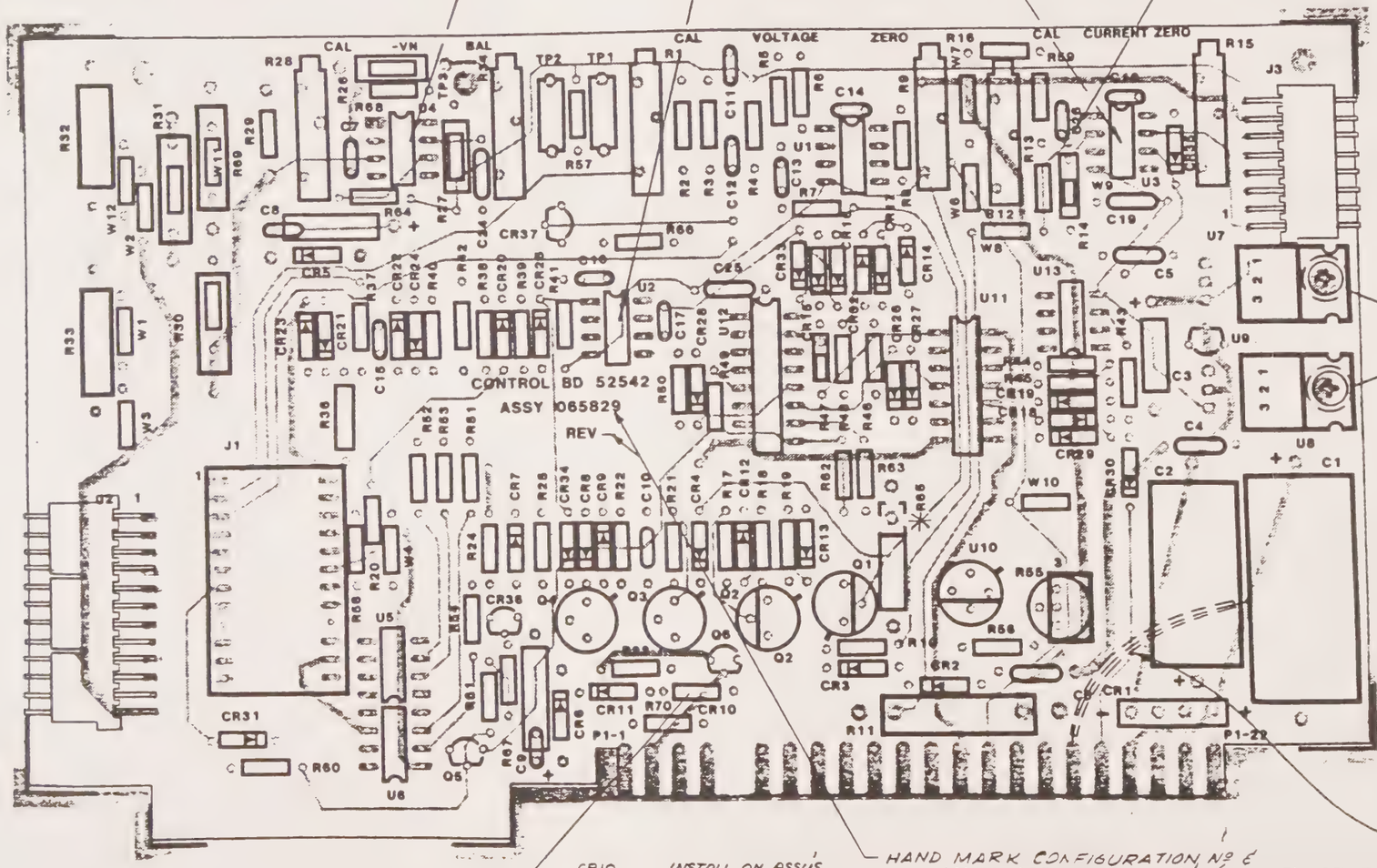
PARTS LIST	MODEL
065829 12	HRP 36-10 (OPT 32)
13	8-20
14	HFP 500-1 (OPT 32)
15	QFP 100-1.5
16	200-.8
17	HFP 150-2
18	HRP 36-10
19	60-7
20	60-7 (OPT 32)
21	36-10 (OPT 32)

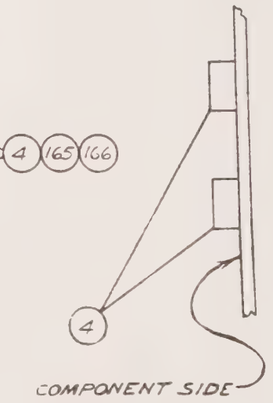
PARTS LIST	MODEL
065829 22	HRP 8-20 (OPT 32)
23	HFP 150-2
24	30-15
25	150-2 (OPT 32)
26	30-15 (OPT 32)
27	150-3
28	500-1

NOTES 1) DO NOT USE GLASS BEADS ON CAPACITORS

2) TRANSISTOR PAD USED ONLY ON METAL TYPE

RESISTOR R14 MOUNTS IN TOP HOLE





*NOTE RG5 1/2 W & NO OHM RES TO BE MOUNTED IN MIDDLE HOLE. RG5 1W RES MOUNTS IN TOP HOLE.

*22 AWG W/SL (OPT-32 ONLY)

HAND MARK CONFIGURATION Nº & REV LEVEL APPEARING ON P/L (DO NOT USE DWG REV. LEVEL)

CR10 INSTALL ON ASSY'S Q2, Q3 & 12

CR10 INSTALL ON ALL OTHER ASSY'S

DETAIL

CR37 CR36

Figure 6-5
Control PCB
065829 TAB REV G3

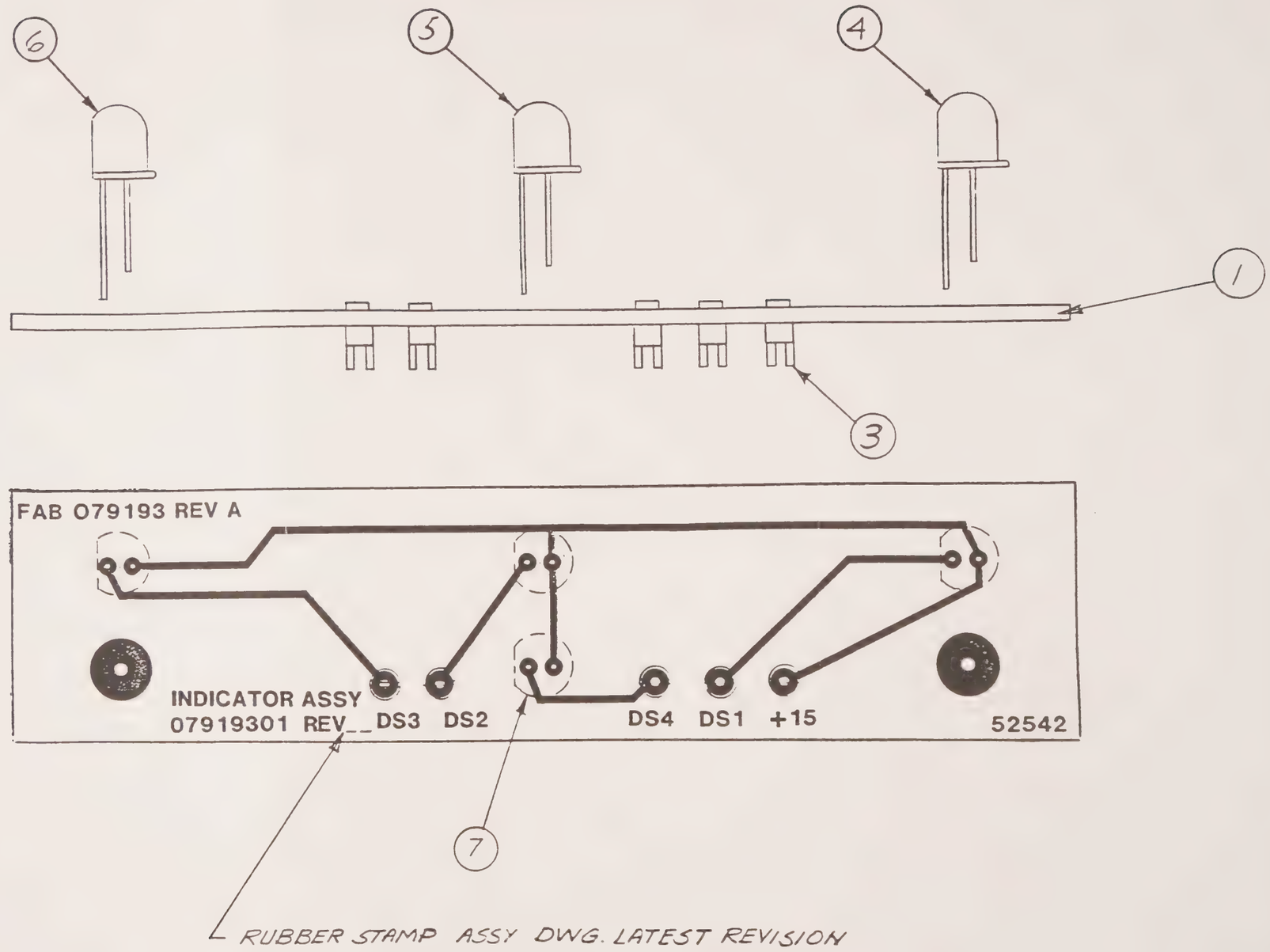
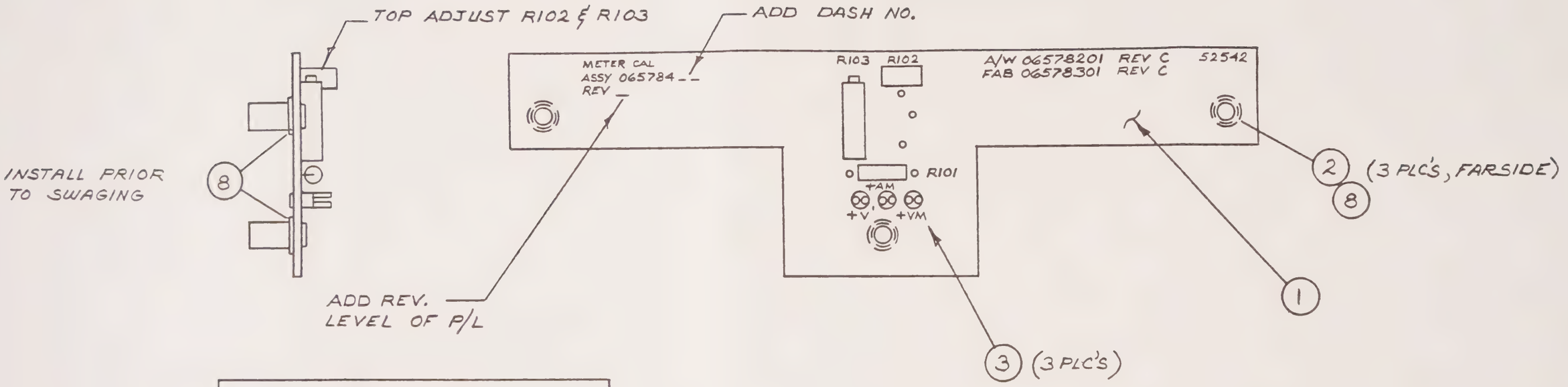
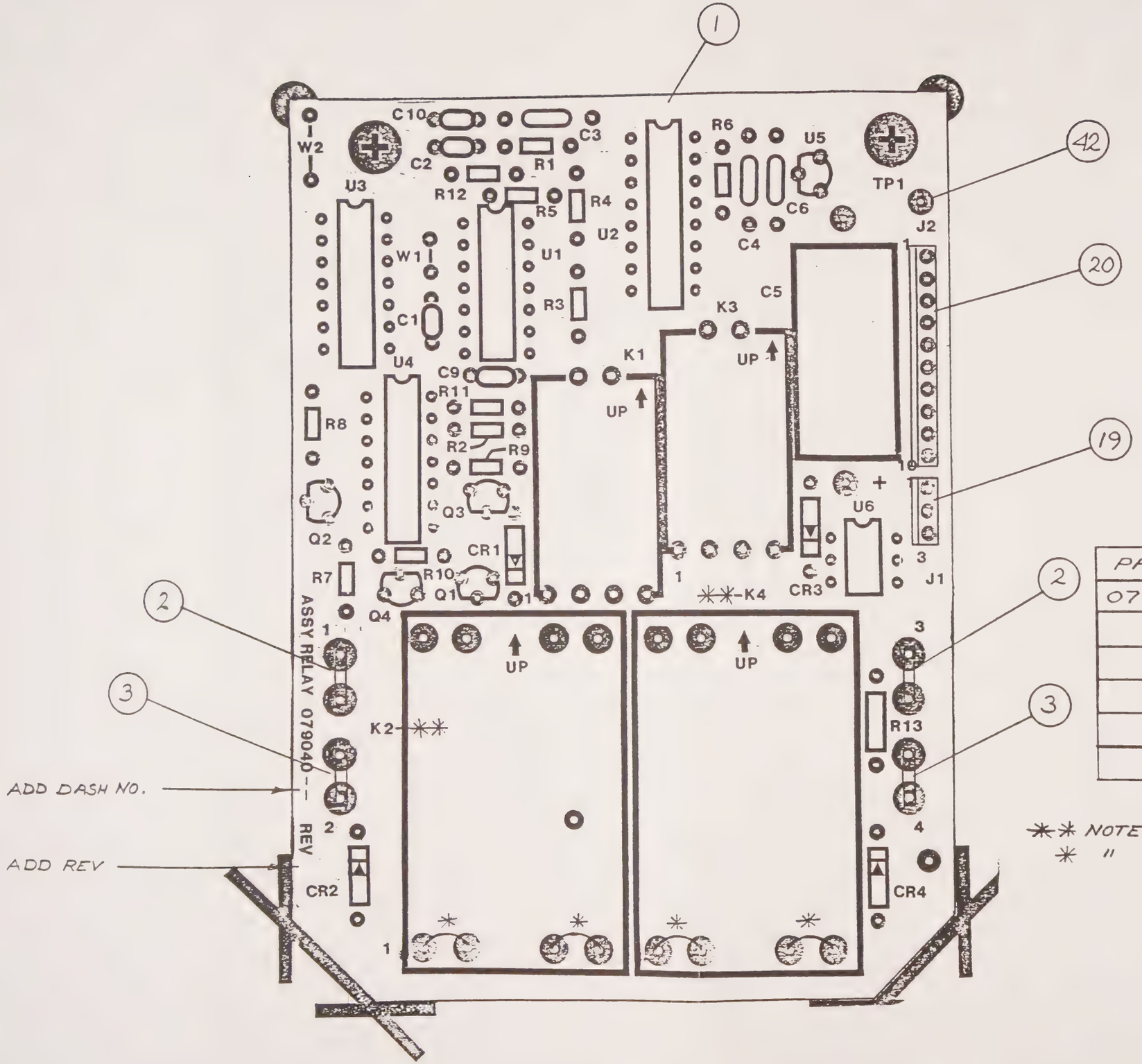


Figure 6-6
Indicator PCB
07919301 REV A



TABULATION		
DASH NO.	MODEL	P/L NO.
01	HRP60-7 " 500-1	06578401
02	HRP36-10	02
03	HRP200-1	03
04	HRP8-20	04
05	HFP-SERIES	05

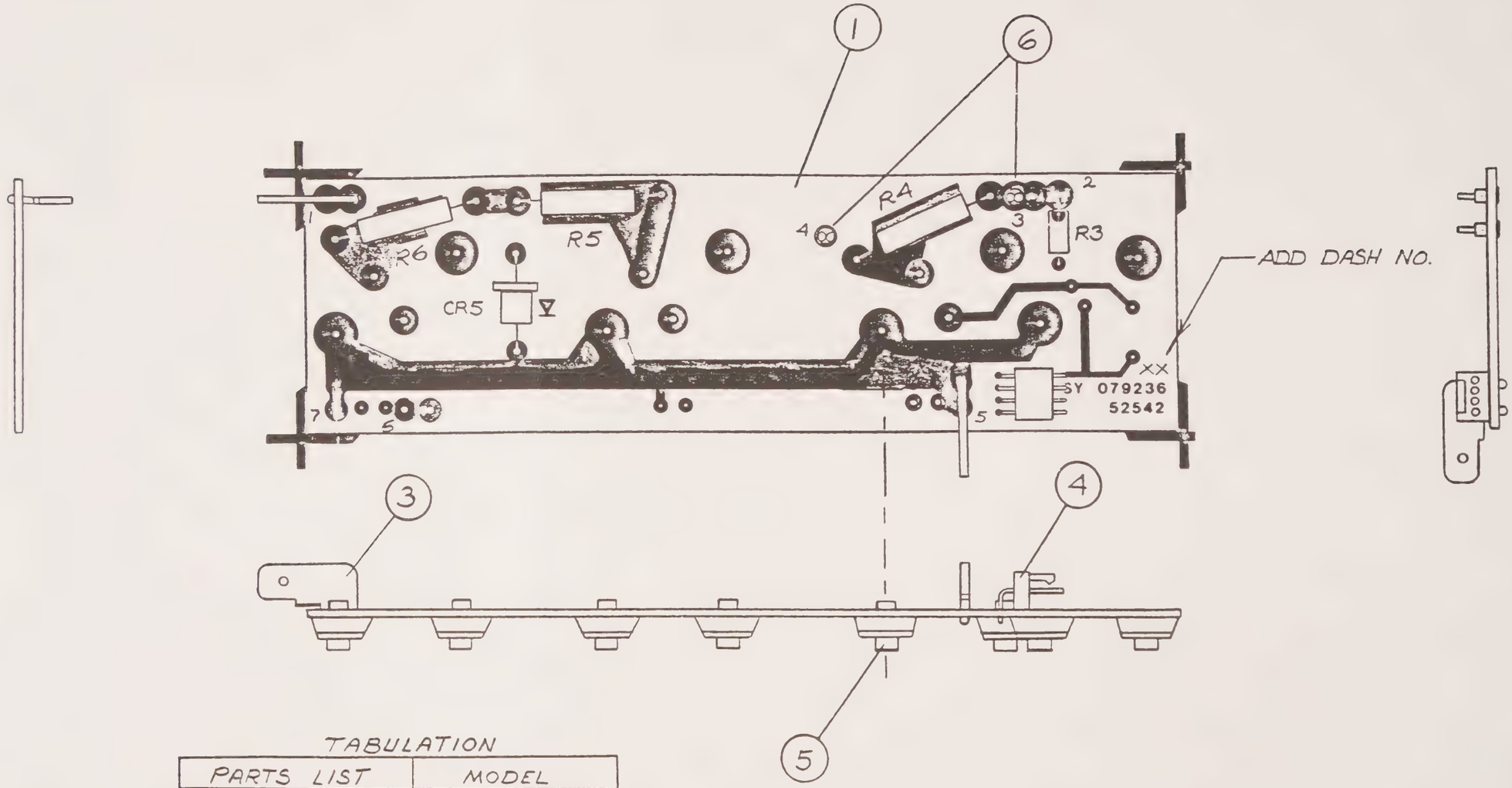
Figure 6-7
Meter CAL PCB
065784 TAB REV A



PARTS LIST	MODEL
07904001	QFP, HRP, HFP
02	
05	
06	
07	
08	

** NOTE - K2 & K4 ARE AFTER SOLDER PARTS
* " - USE #20 AWG BUS - IF P/L SAYS TO USE JUMPERS IN PLACE OF K2 & K4

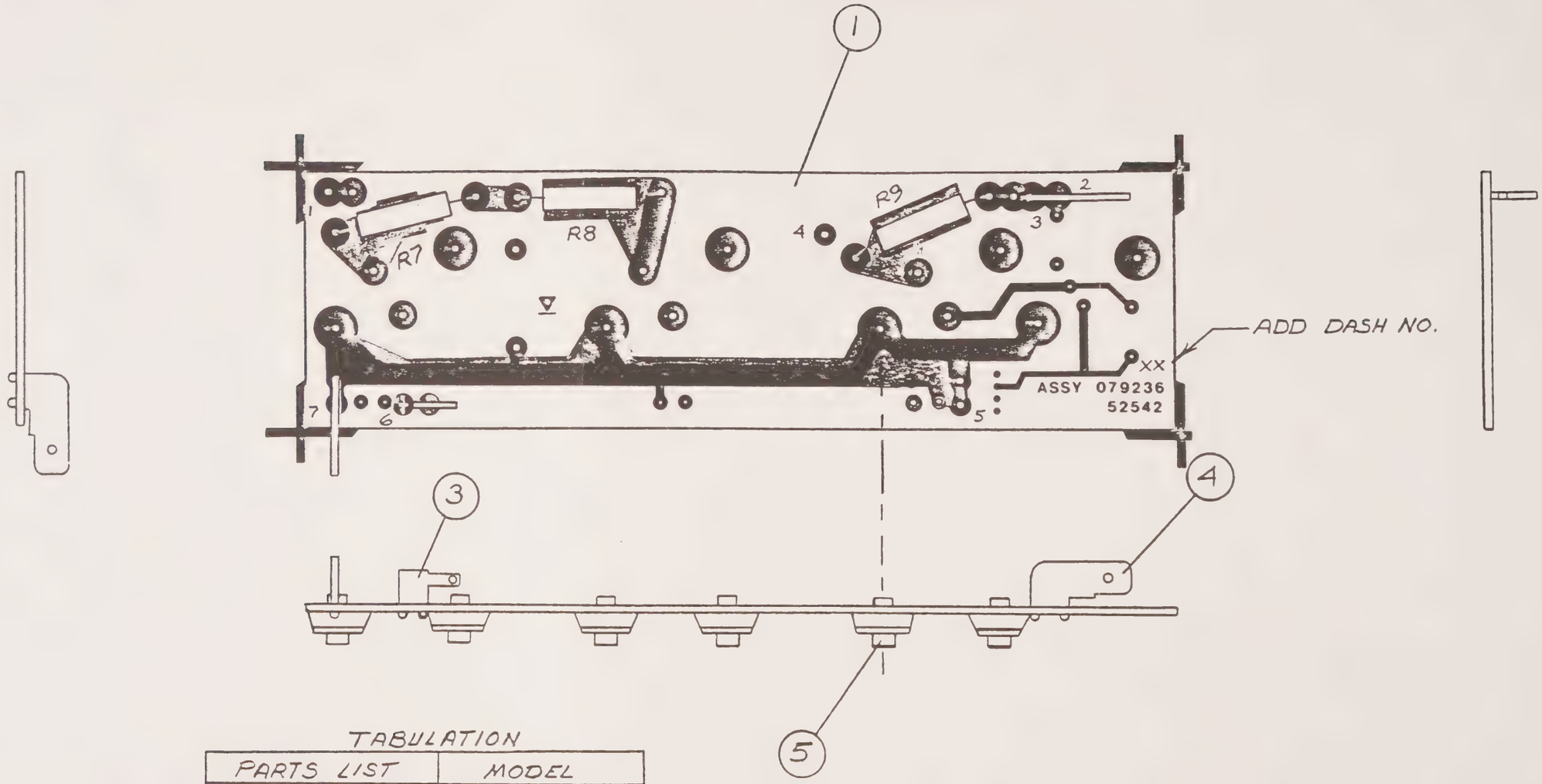
Figure 6-8
Relay PCB
079040 TAB REV A



TABULATION

PARTS LIST	MODEL
079236 01	HFP 30-15
1 05	1 150-3

Figure 6-9 (Sheet 1 of 2)
Series Pass PCB Left HFP
079236 TAB REV A



TABULATION

PARTS LIST	MODEL
079236 02	HFP 30-15
1 06	1 150-3

Figure 6-9 (Sheet 2 of 2)
Series Pass PCB Right HFP
079236 TAB REV A

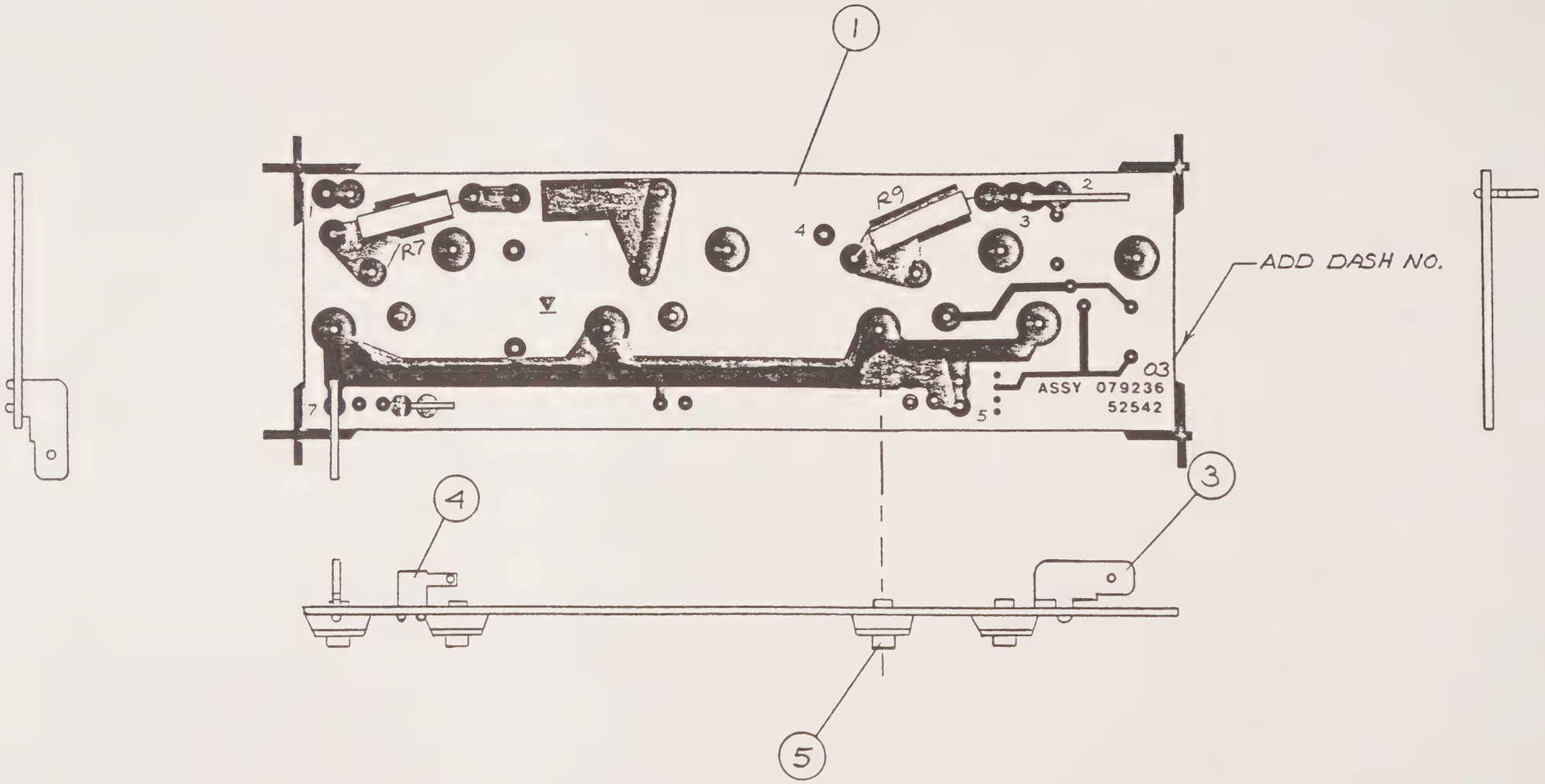


Figure 6-10
Series Pass PCB Right HFP 150-2
07923603 TAB REV A

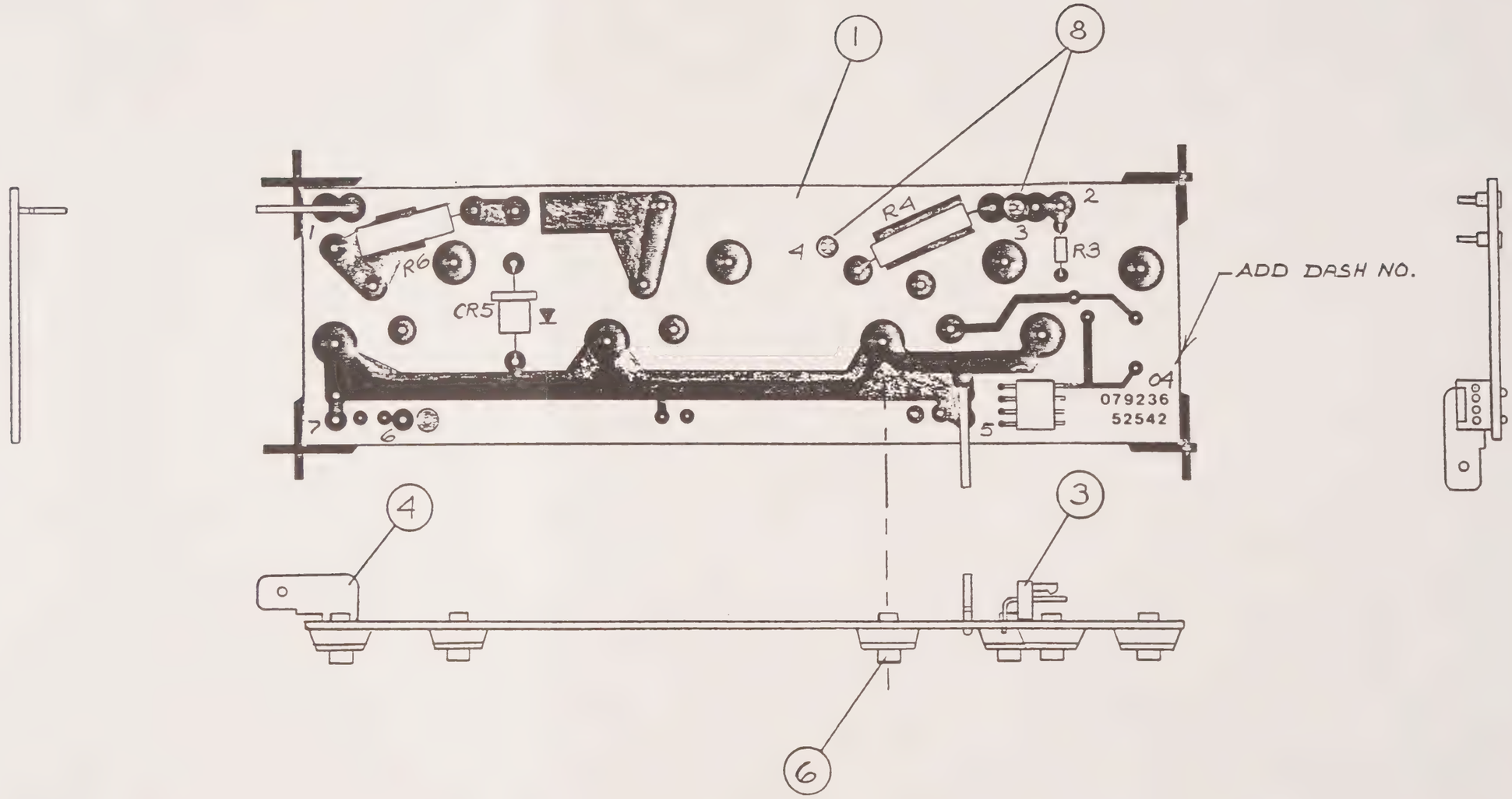
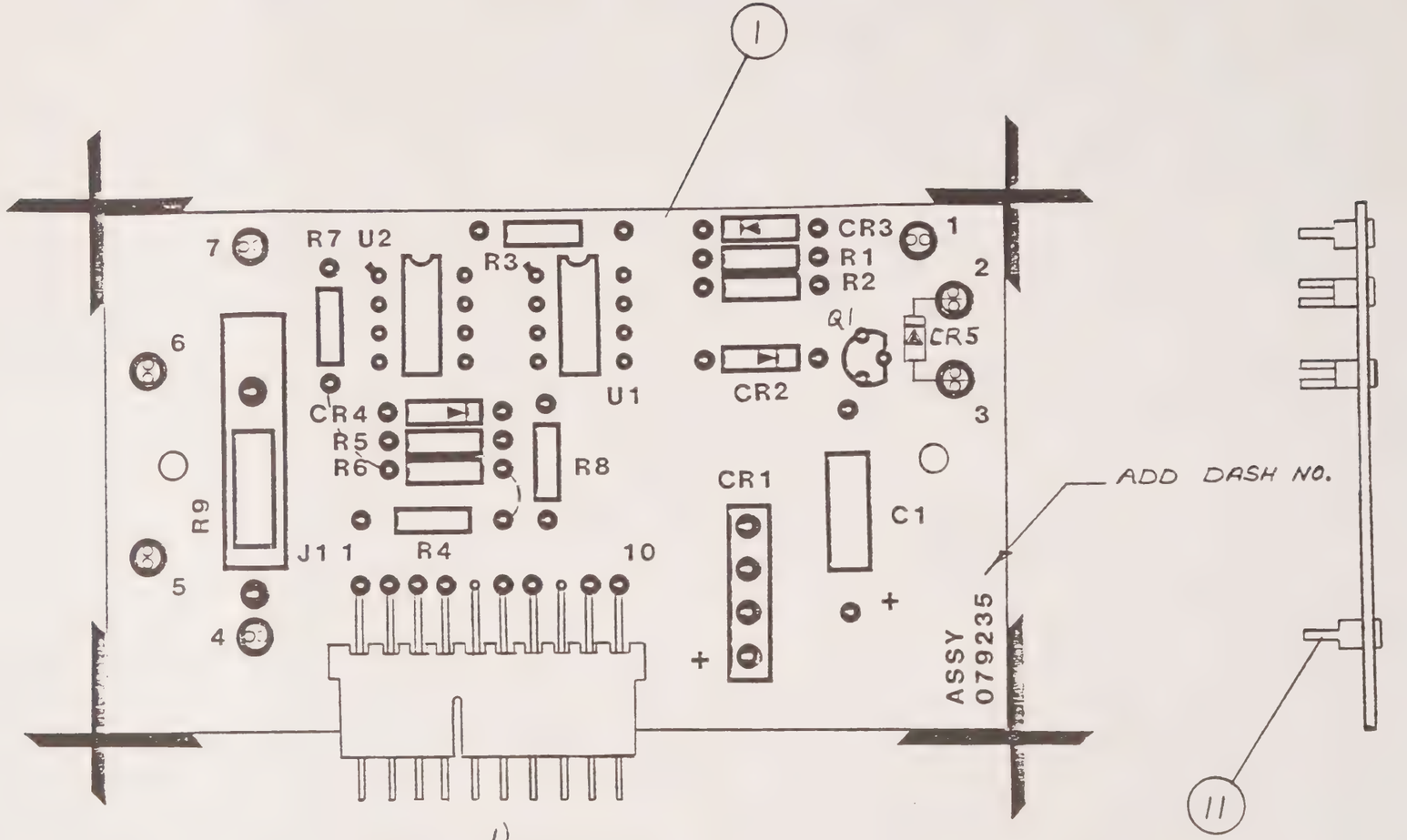


Figure 6-11
Series Pass PCB Left HFP 150-2
07923604 REV A

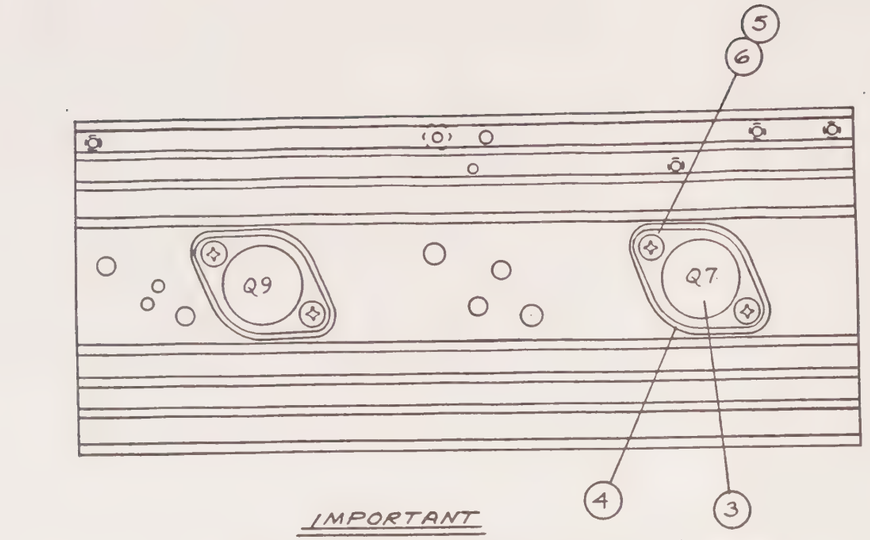


NOTE: 1) FOR REV A FAB - ADD JUMPERS ON REAR SIDE OF PCB (SHOWN DASHED) #22 AWG BUS W/SLEEVING.

2) CR5 IS AFTER SOLDER COMP.

TABULATION		
079235 TAB	MODEL	P/L
01	HFP 30-15	079235 01
02	150	02

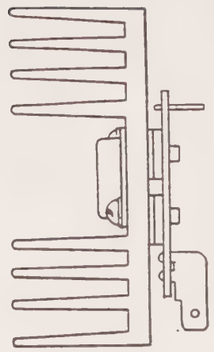
Figure 6-12
Switch Control PCB
079235 TAB REV A



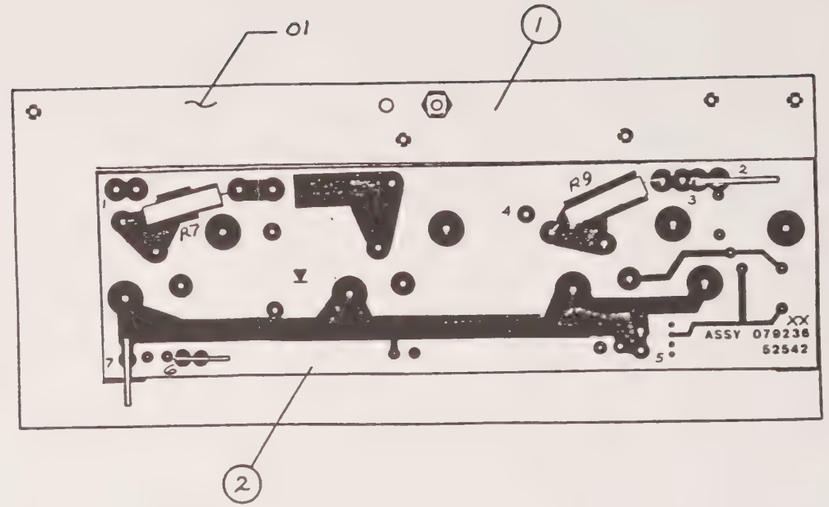
IMPORTANT

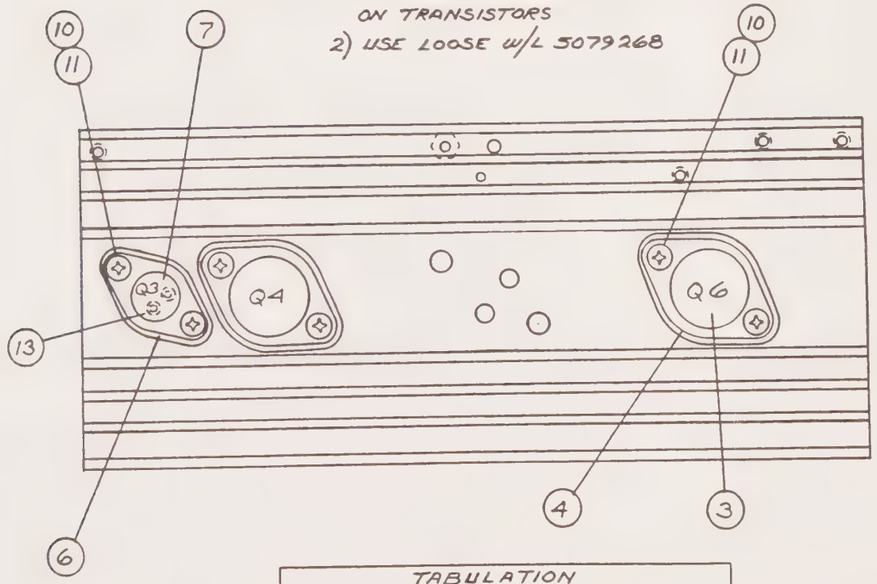
NOTE 1) USE THERMAL COMPOUND P/N 100750 ON TRANSISTORS

2) USE LOOSE W/L 5079268

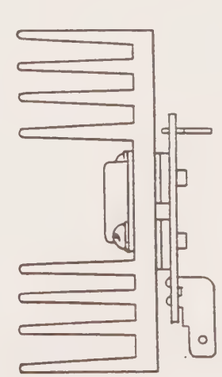


RIGHT H.S.





TABULATION		
HEATSINK	MODEL	P/L
RIGHT	HFP130-2	079249 01
LEFT	|	| 02



LEFT H.S.

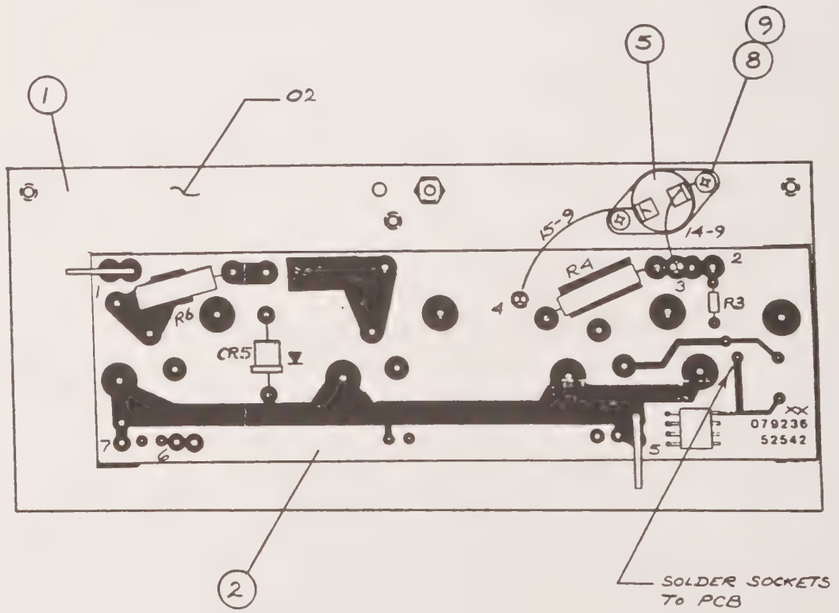
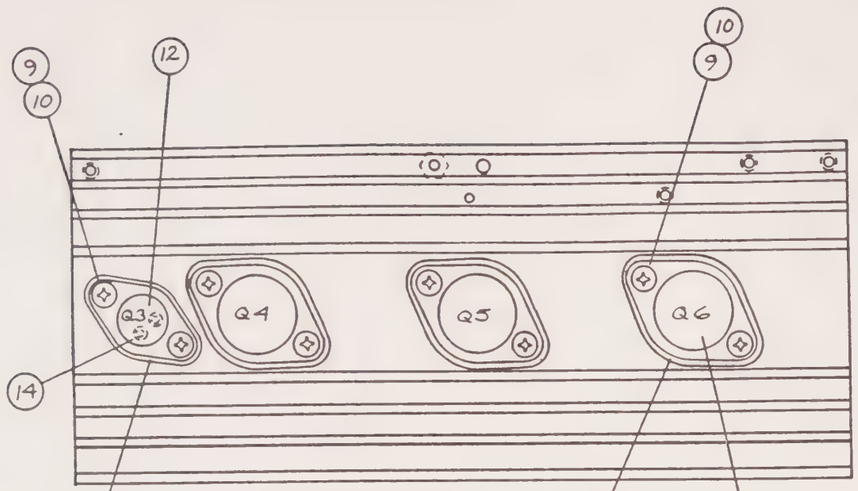
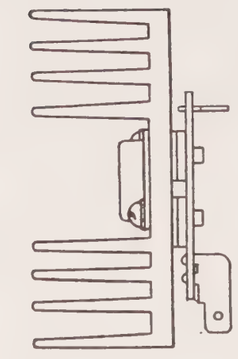


Figure 6-13 (Sheet 1 of 2)
Heat Sink
079249 TAB REV A

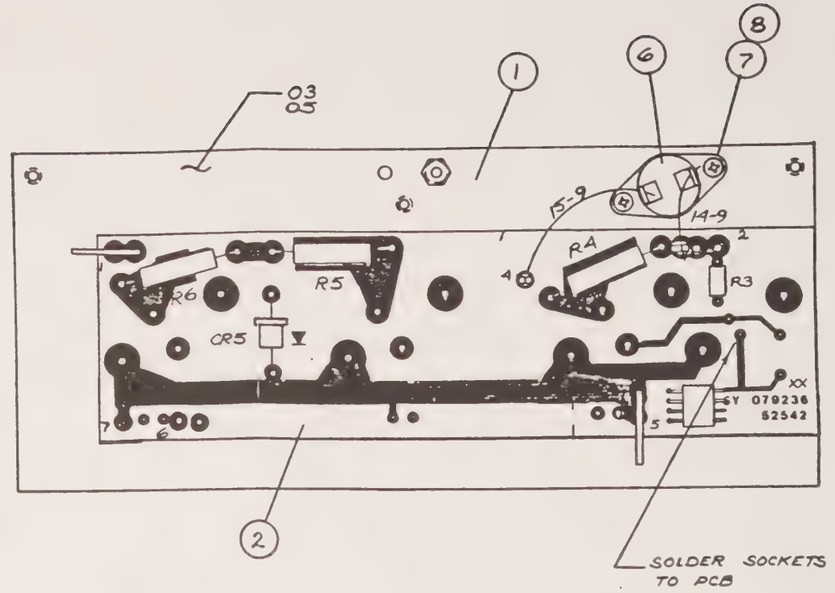


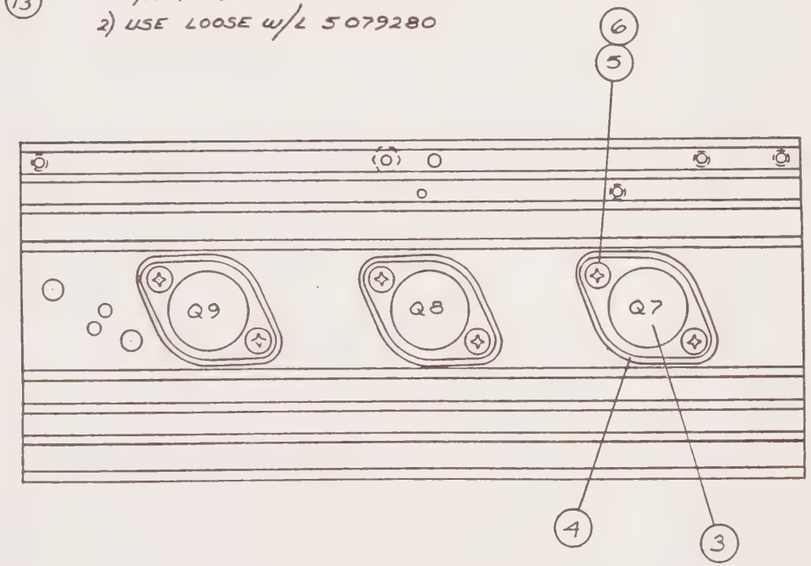
NOTES IMPORTANT

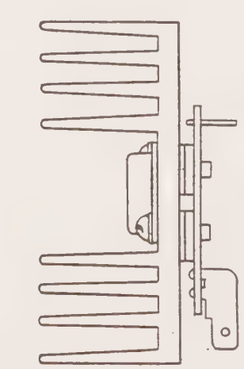
1) USE THERMAL COMPOUND P/N 100750 ON TRANSISTORS
2) USE LOOSE W/L 5079280



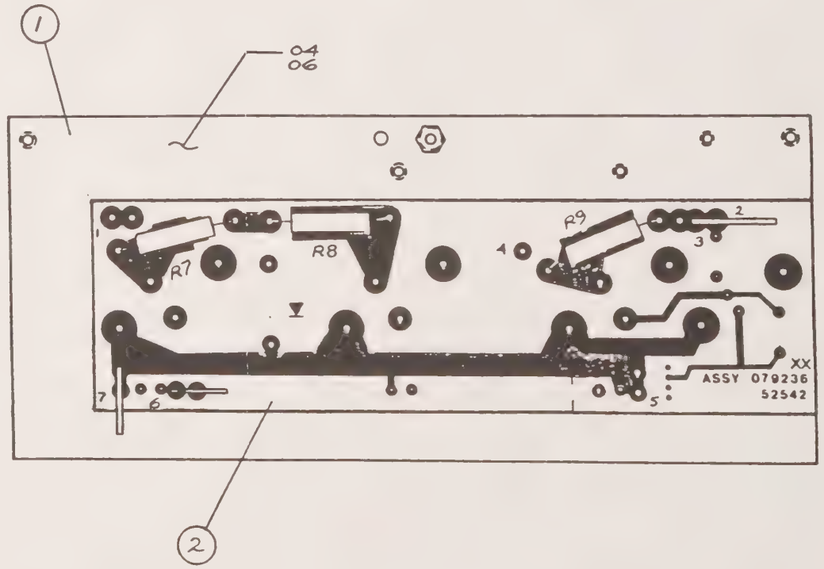
LEFT H.S.





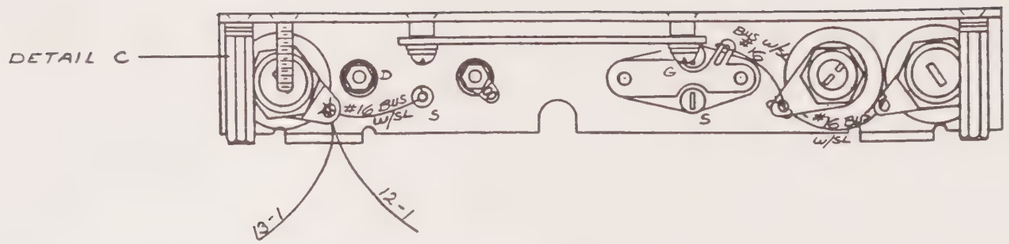


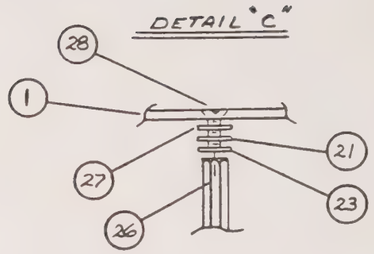
RIGHT H.S.

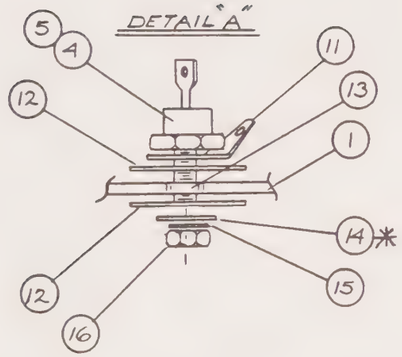


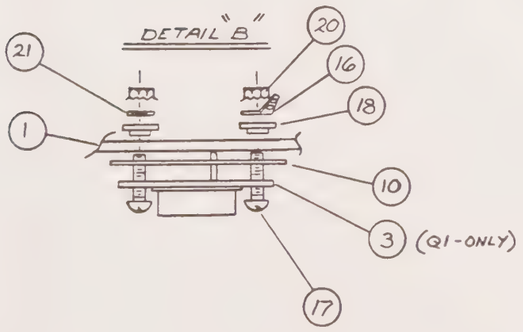
TABULATION			
HEATSINK	MODEL	P/L	
LEFT	HFP30-15	07924903	
RIGHT	"	"	04
LEFT	HFP150-3	"	05
RIGHT	"	"	06

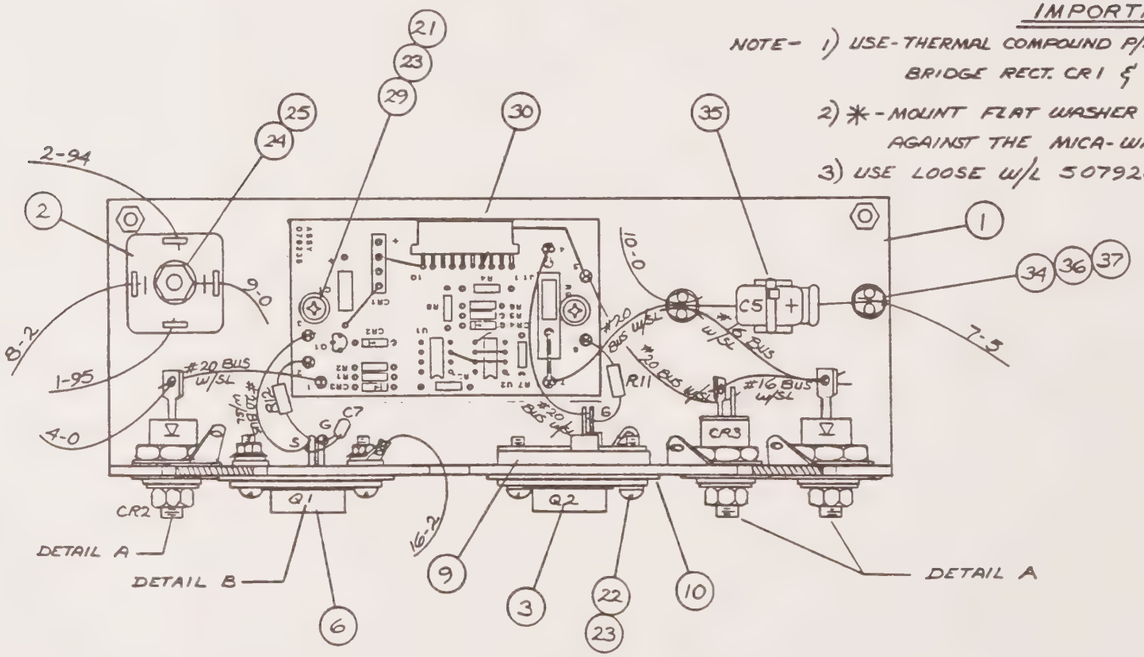
Figure 6-13 (Sheet 2 of 2)
Heat Sink
079249 TAB REV A











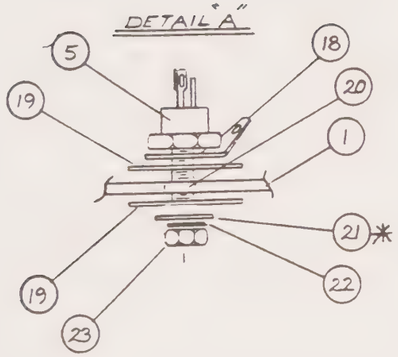
IMPORTANT

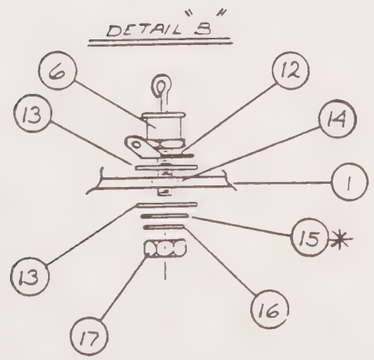
NOTE- 1) USE-THERMAL COMPOUND P/N 100750 ON DIODES, SCR, BRIDGE RECT. CR1 & TRANSISTORS.

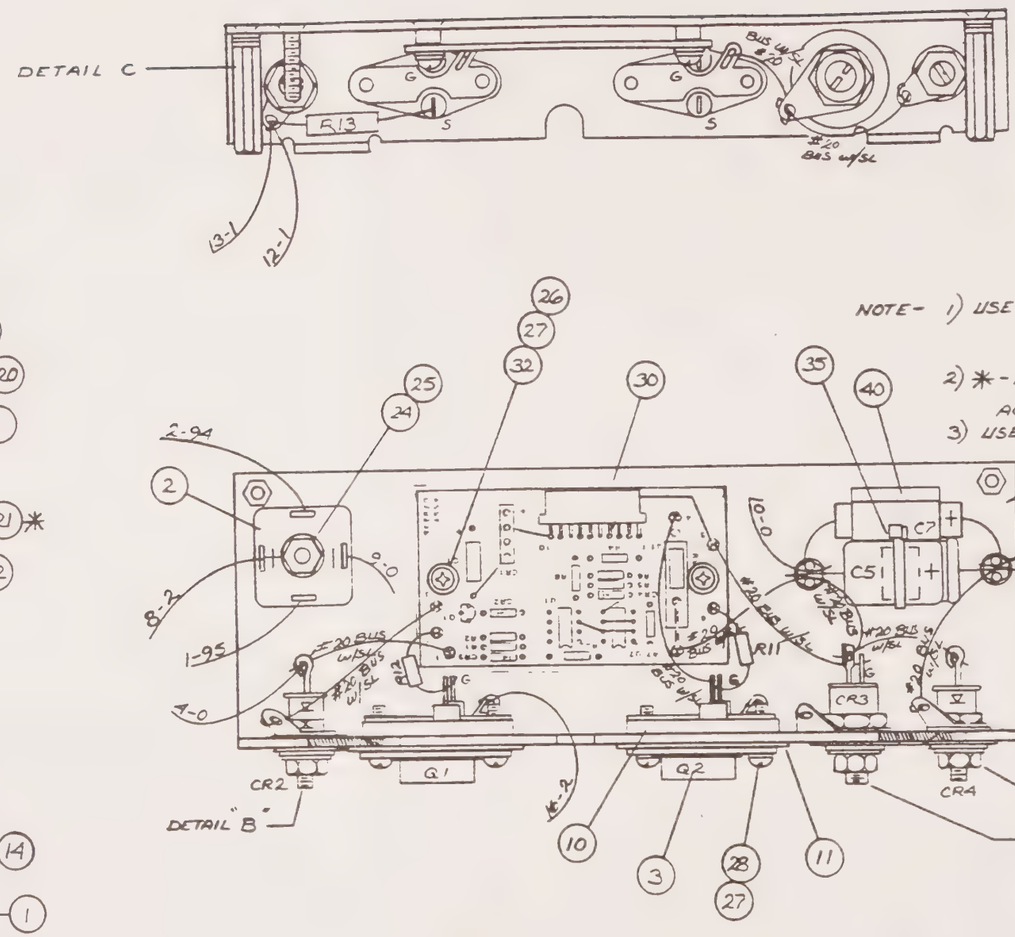
2) * - MOUNT FLAT WASHER WITH SMOOTH SURFACE AGAINST THE MICA-WASHER

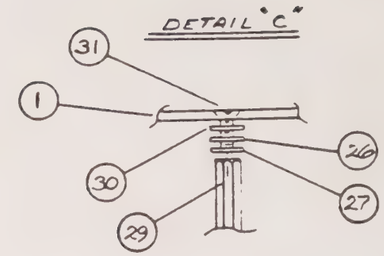
3) USE LOOSE W/L 5079280

Figure 6-14
Heat Sink Support Assembly HFP 30
07923901 REV A









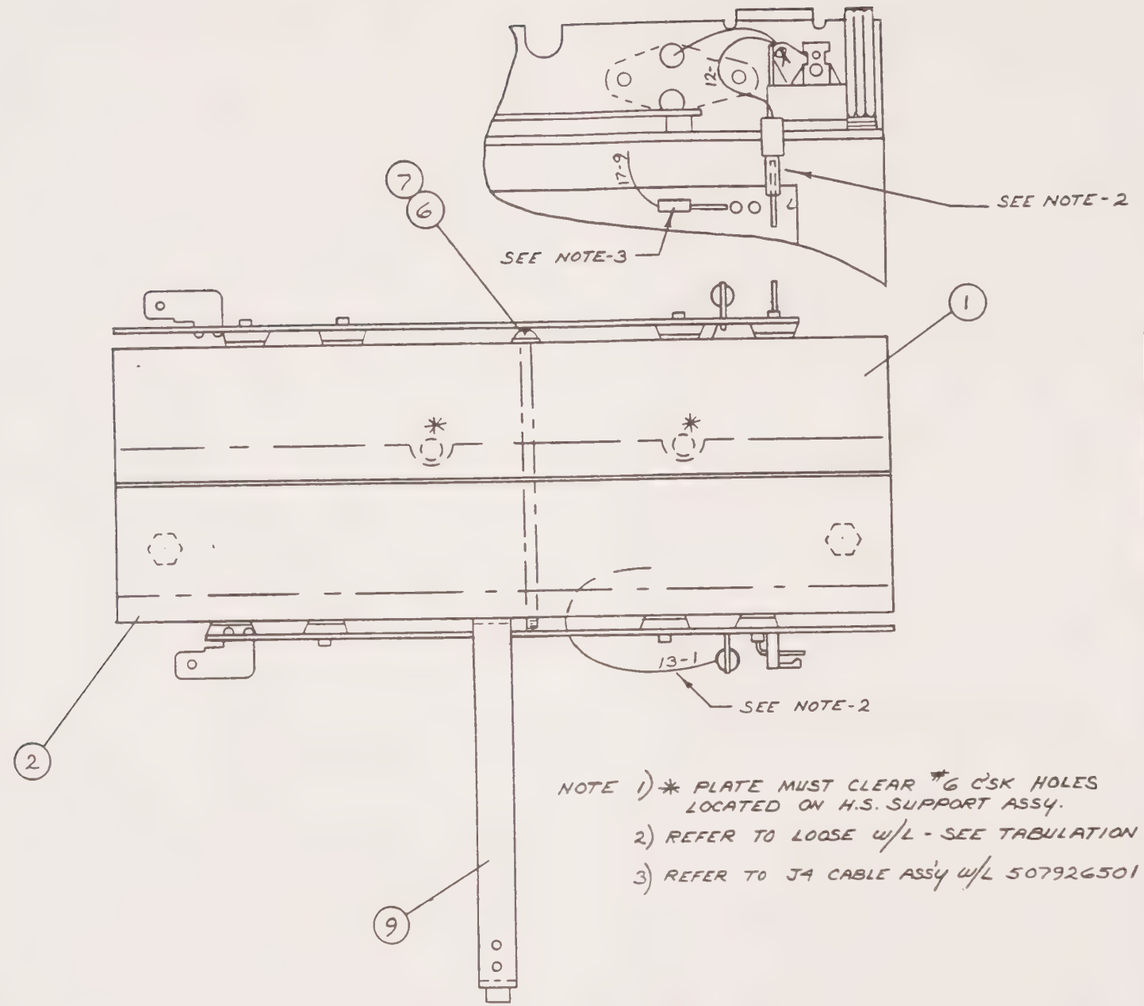
IMPORTANT

NOTE- 1) USE THERMAL COMPOUND P/N 100750 ON DIODES, SCR, BRIDGE RECT. CR1 & TRANSISTORS.

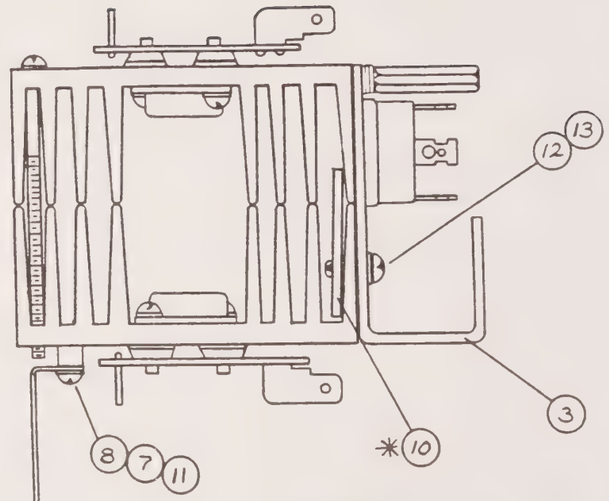
2) * - MOUNT FLAT WASHER WITH SMOOTH SURFACE AGAINST THE MICA-WASHER

3) USE LOOSE W/L S 079268

Figure 6-15
Heat Sink Support Assembly HFP 150
07923902 REV A



NOTE 1) * PLATE MUST CLEAR #6 CSK HOLES LOCATED ON H.S. SUPPORT ASSY.
2) REFER TO LOOSE W/L - SEE TABULATION
3) REFER TO J4 CABLE ASS'Y W/L 507926501

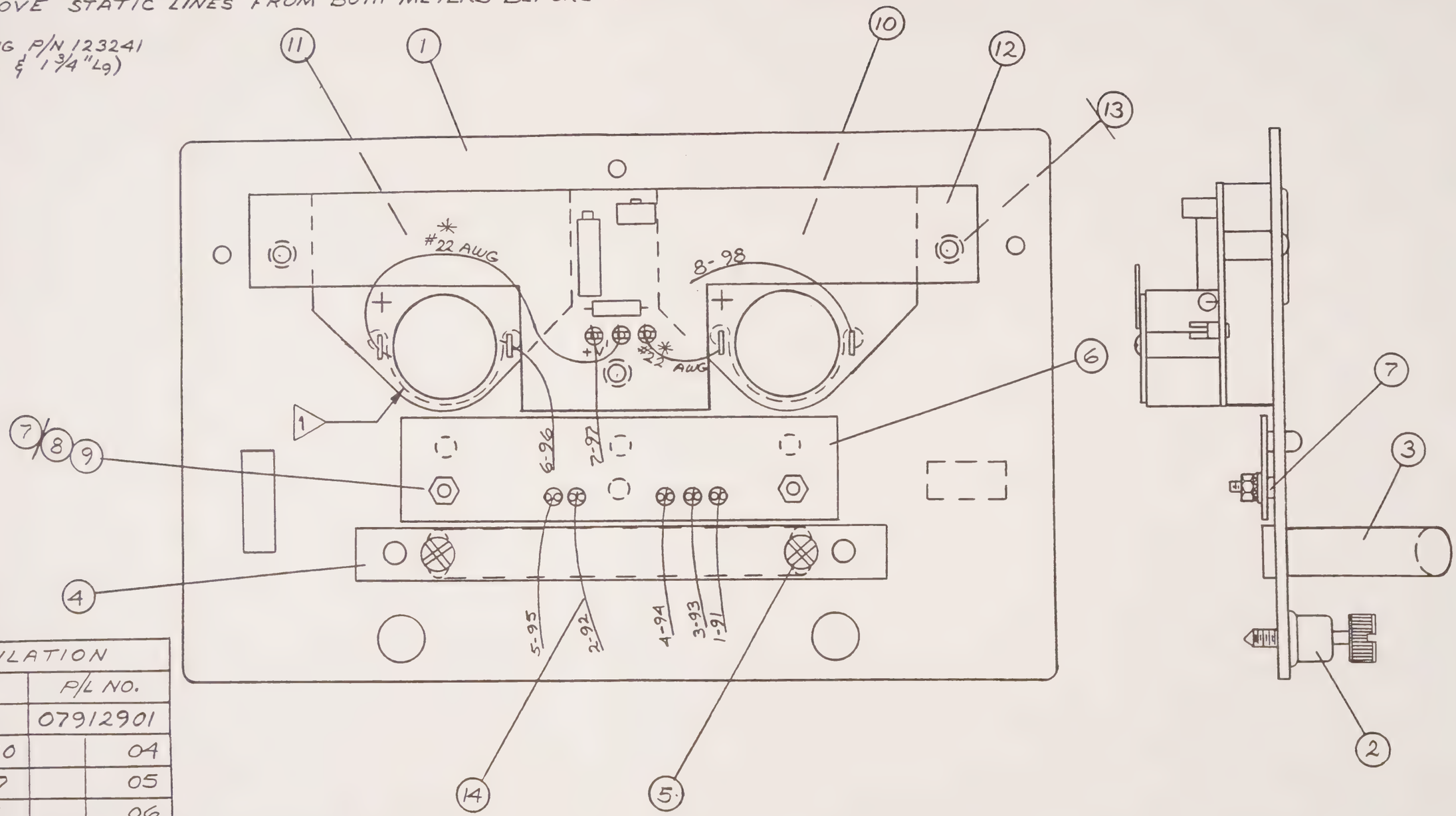


TABULATION			
079263 TAB	MODEL	P/L	W/L LOOSE
01	HFP 30-15	07926301	5079280
02	150-2	02	5079268
03	-3	03	5079268

Figure 6-16
Heat Sink Top Assembly
079263 TAB REV A

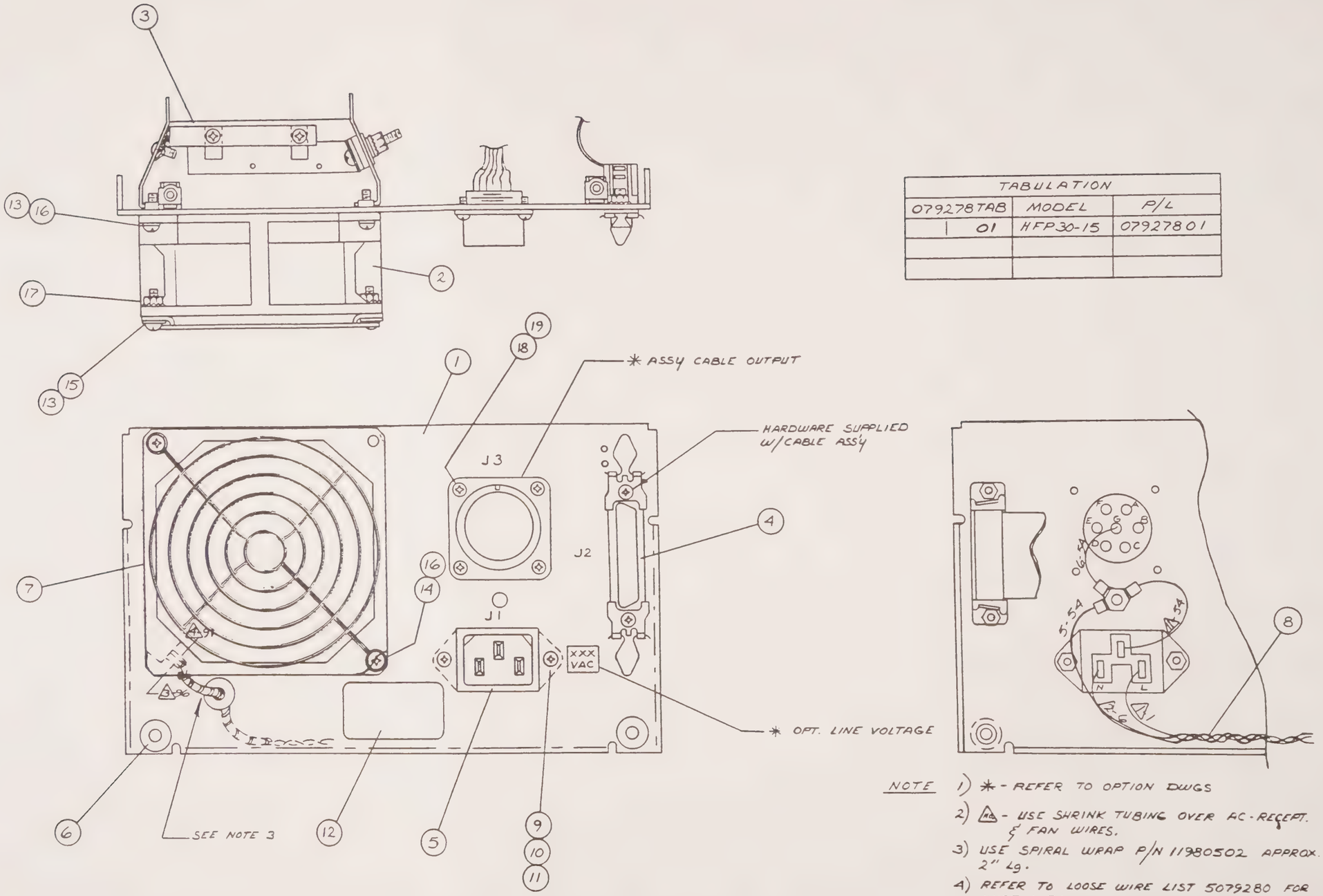
▷1 REMOVE STATIC LINES FROM BOTH METERS BEFORE WIRING

✳ - 22 AWG P/N 123241
(4 1/2" Lg & 1 3/4" Lg)



TABULATION	
MODEL	P/L NO.
HRP8-20	07912901
HRP36-10	04
HRP60-7	05
HFP30-15	06
HFP150-2	07
HFP150-3	08

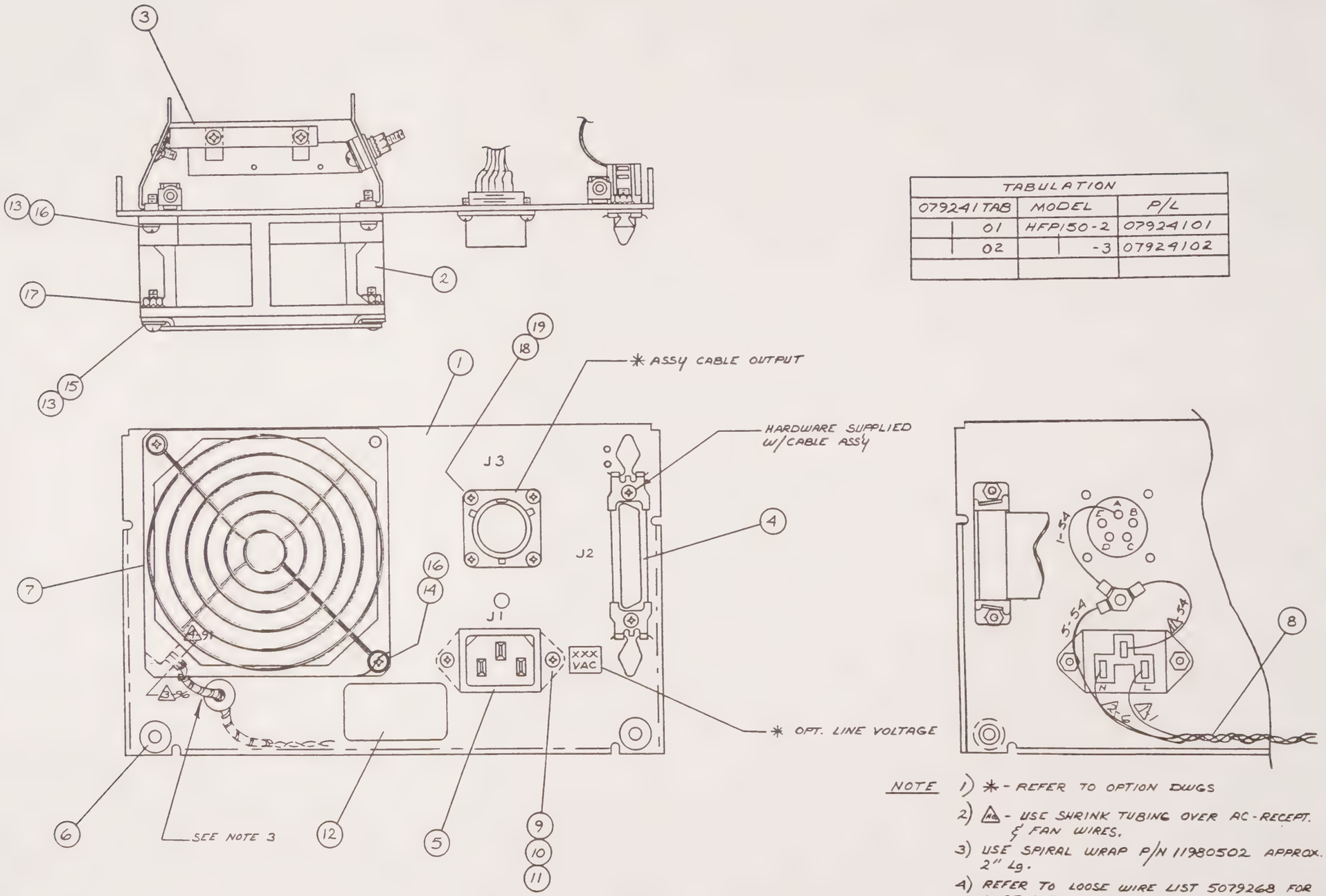
Figure 6-17
Front Panel with Meters
079129 TAB REV A



TABULATION		
079278TAB	MODEL	P/L
01	HFP30-15	07927801

NOTE
1) * - REFER TO OPTION DWGS
2) ⚠ - USE SHRINK TUBING OVER AC-RECEPT. & FAN WIRES.
3) USE SPIRAL WRAP P/N 11980502 APPROX. 2" Lg.
4) REFER TO LOOSE WIRE LIST 5079280 FOR WIRE 1-54

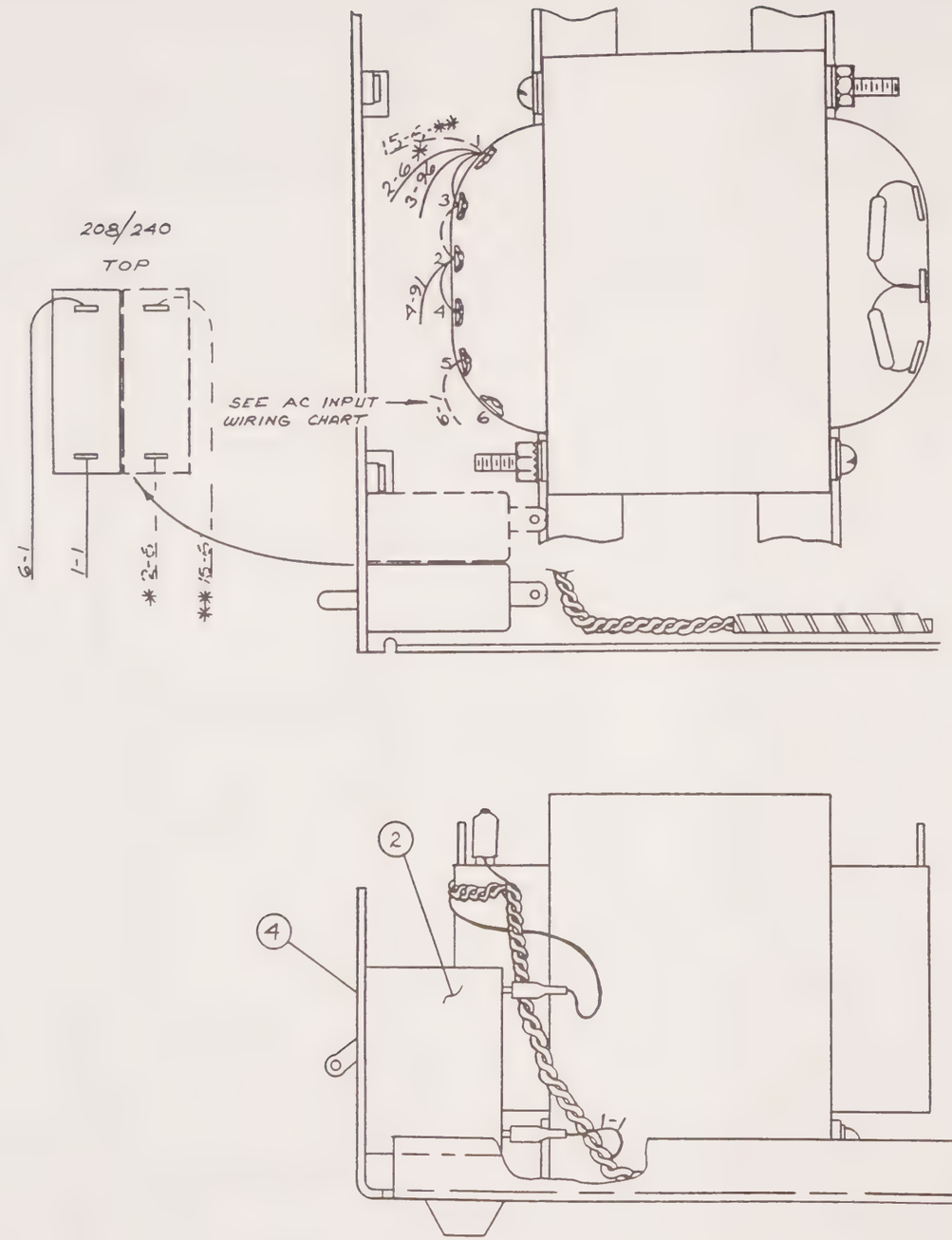
Figure 6-18
Rear Panel Assembly HFP 30
079278 TAB REV A



TABULATION		
079241 TAB	MODEL	P/L
01	HFP150-2	07924101
02	-3	07924102

NOTE
1) * - REFER TO OPTION DWGS
2) ⚠ - USE SHRINK TUBING OVER AC-RECEPT. & FAN WIRES.
3) USE SPIRAL WRAP P/N 11980502 APPROX. 2" Lg.
4) REFER TO LOOSE WIRE LIST 5079268 FOR WIRE 1-54

Figure 6-19
Rear Panel Assembly HFP 150
079241 TAB REV A

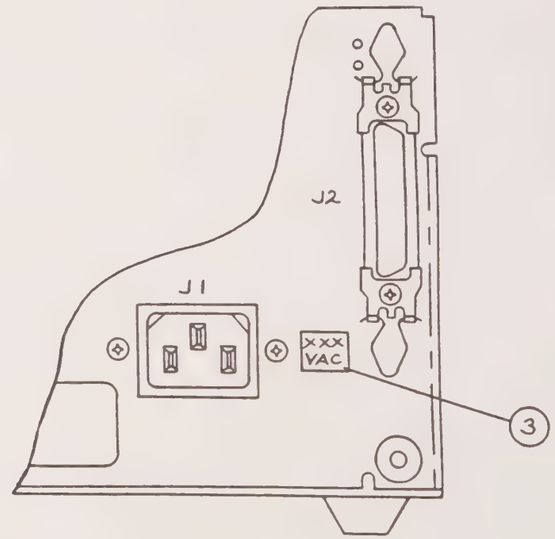


AC - INPUT WIRING			
OPTION	VOLTAGE	#16 AWG JUMPER	LINE TO T1
10	100V	1-3, 2-5	TO TERM. 4
01	115V/120V	1-3, 2-5	5
11 & 12	208V/220V	2-3	4
13 & 14	230V/240V	2-3	5

NOTE 1) USE SHRINK TUBING OVER TERM'S 1 THRU 6

*2) FOR 208/240 VAC REMOVE WIRE 2-6 FROM TERM-1 ON XFORMER & ADD TO CB1 CIRCUIT BKR. USE LUG P/N 117852 (BB) OR

**3) ADD WIRE 15-6 FOR 208/240 VAC INPUT. REFER TO LOOSE W/L 5079281



- 14	240 VAC	079190	06
- 13	230		05
- 12	220		04
- 11	208		03
- 01	115		01
OPT. NO.	INPUT VOLT.	PARTS LIST	

Figure 6-20
Line Voltage Options
079270 TAB REV A

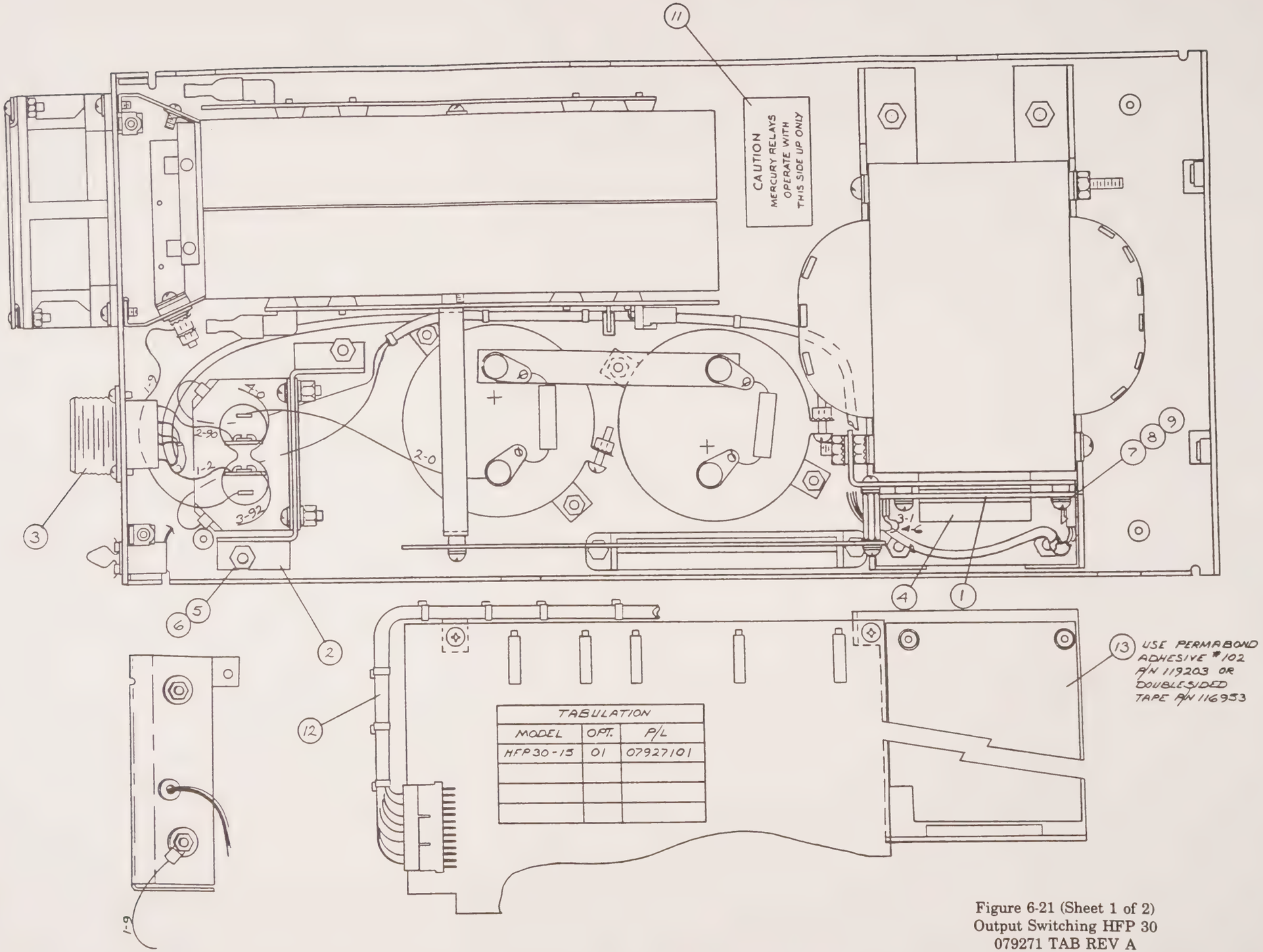


Figure 6-21 (Sheet 1 of 2)
Output Switching HFP 30
079271 TAB REV A

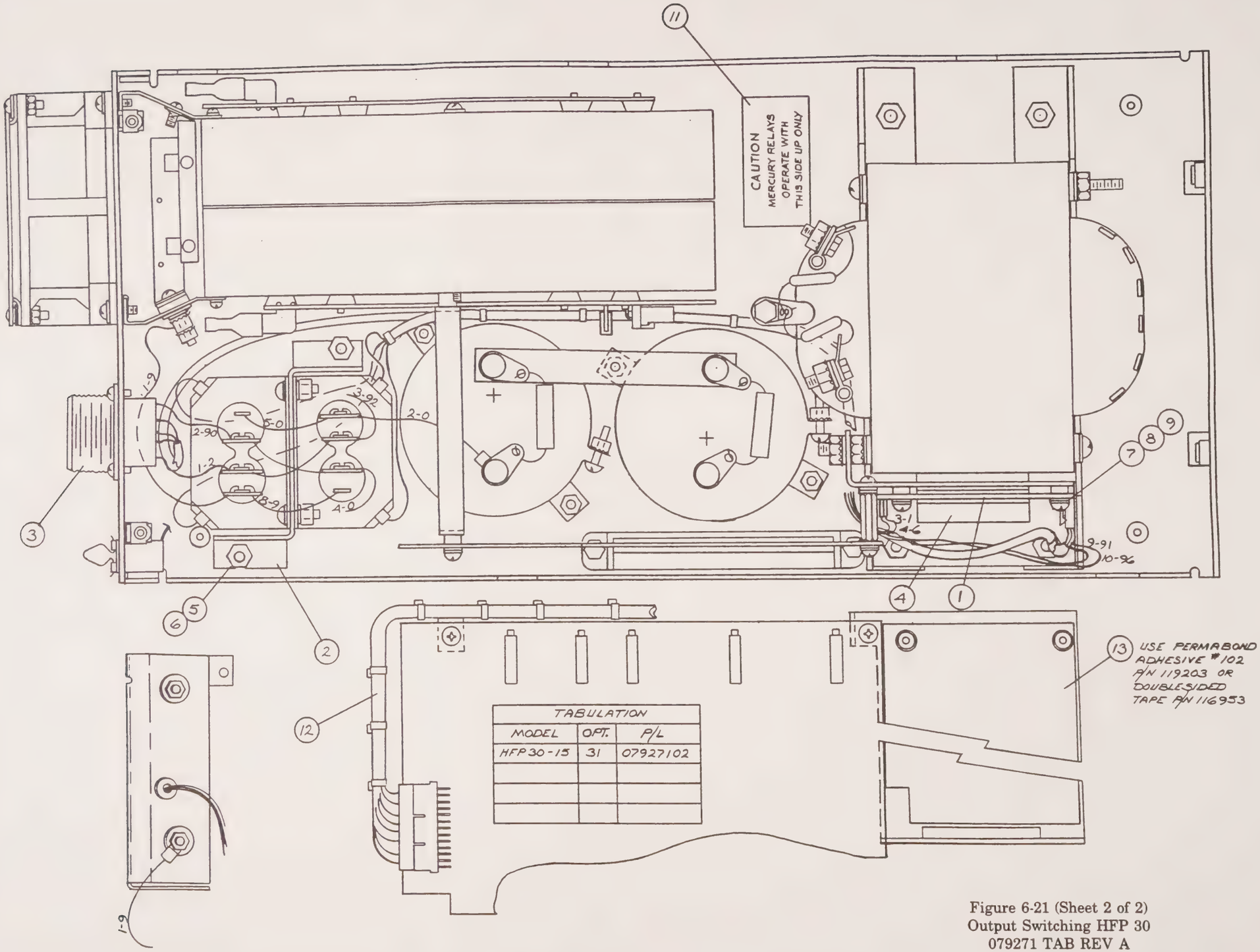
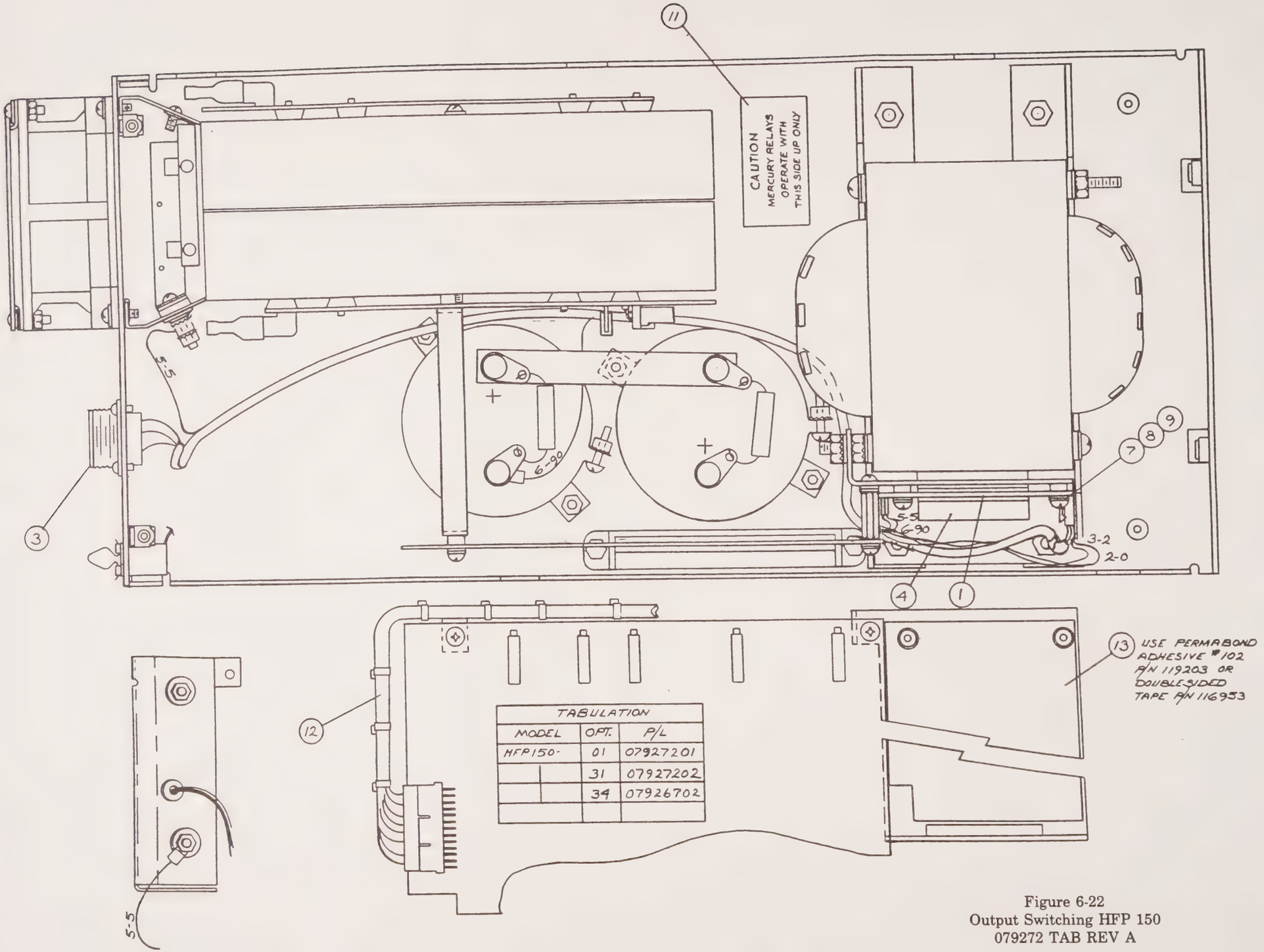


Figure 6-21 (Sheet 2 of 2)
Output Switching HFP 30
079271 TAB REV A



TABULATION		
MODEL	OPT.	P/L
HFP150-	01	07927201
	31	07927202
	34	07926702

Figure 6-22
Output Switching HFP 150
079272 TAB REV A

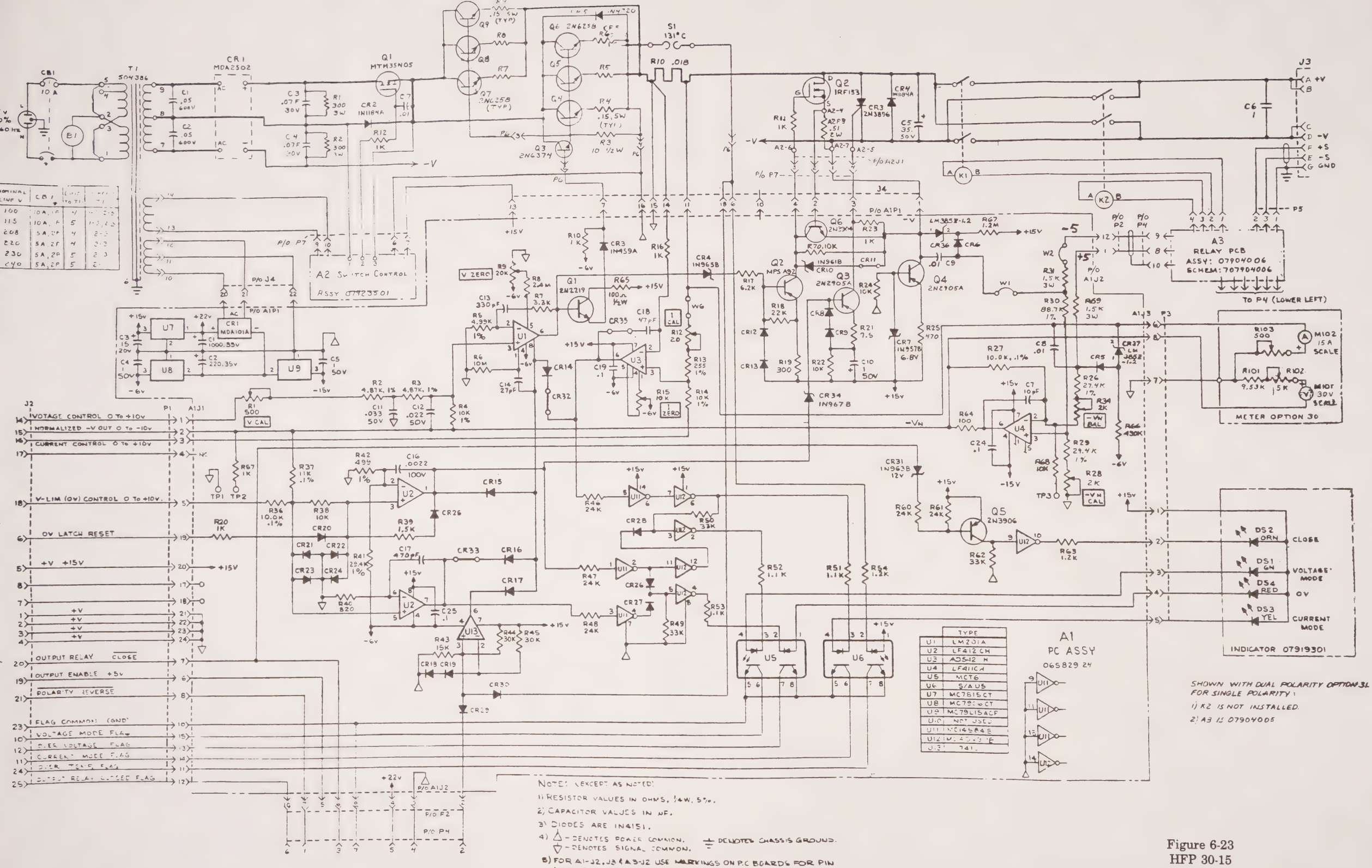


Figure 6-23
HFP 30-15
7-07925101 REV A

Figure 6-24
HFP 150-2
7-07924801 REV A

A2 SWITCH CONTROL
ASSY 07923502

A3 RELAY PC ASSY
SINGLE POL: 07904001
DUAL POLARITY 07904002

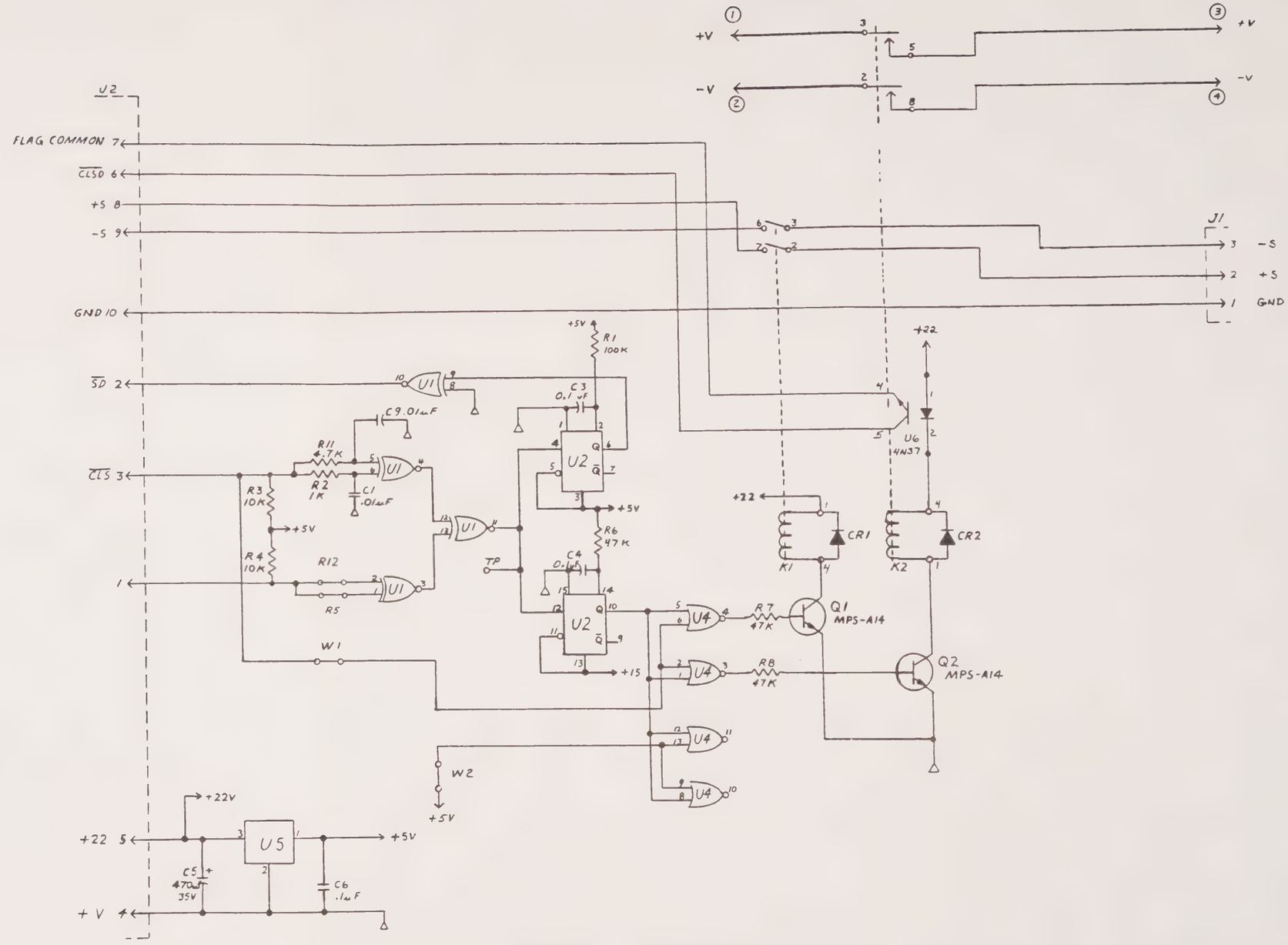
METER OPTION

A1 CONTROL PCB
ASSY 065829-27

	TYPE
U1	LM201AH
U2	LF412CN
U3	AD542L
U4	LF411CN
U5	MOTE
U6	MOTE
U7	MC78[illegible]
U8	MC7906CT
U9	MC79[illegible]
U10	[illegible]
U11	MC14584B
U12	MC14528B
U13	7414

NOTE: (EXCEPT AS NOTED)
1) RESISTOR VALUES IN OHMS, 4W, 5%
2) CAPACITOR VALUES IN μF
3) DIODES ARE IN4491.
4) △ - DENOTES POWER COMMON.
▽ - DENOTES SIGNAL COMMON.

Figure 6-25
HFP 150-3
7-07924802 REV A

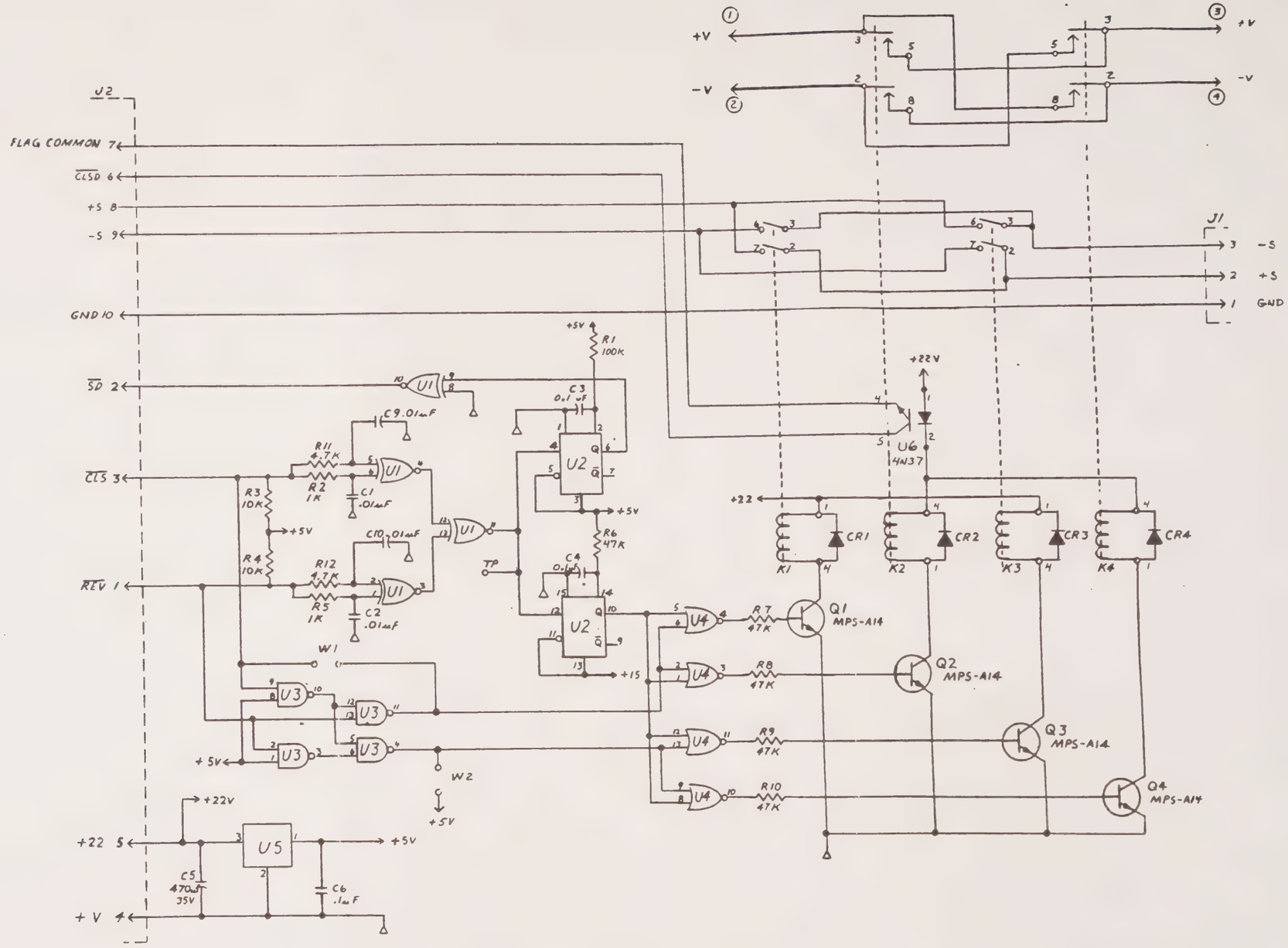


NOTES: 1) RESISTORS ARE ¼ W 5% CARBON COMP.
2) ⏚ DENOTES POWER COMMON.
3) CR1 & CR2 ARE IN4151

CHART

IC	TYPE	COM	+5V
U1	74HC266	7	14
U2	14538B	8	16
U3	NOT USED		
U4	14001B	7	14
U5	MC78L05A		

Figure 6-26
Relay Board Single Polarity
7-07904001 REV A

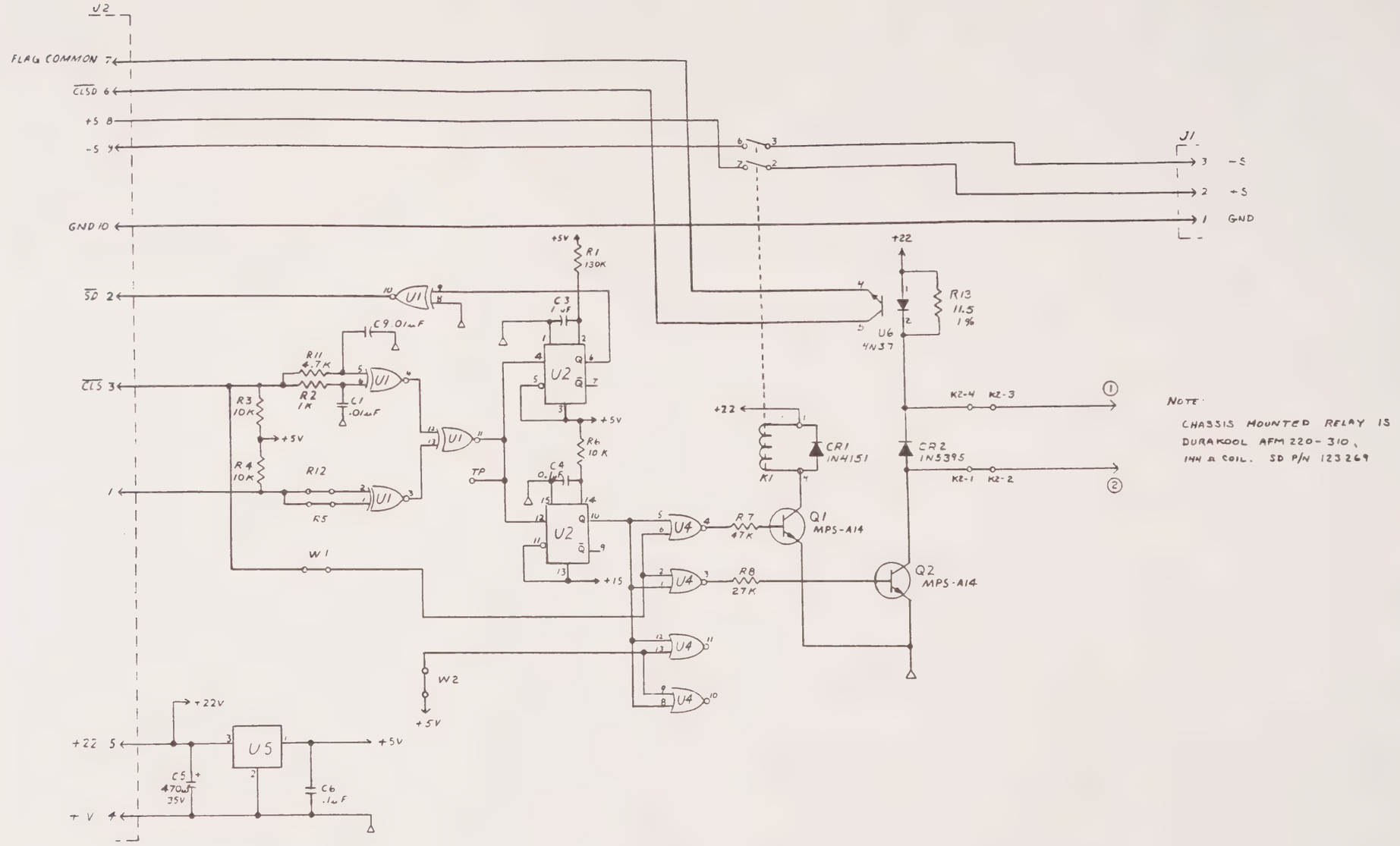


NOTES: 1) RESISTORS ARE 1/8 W 5% CARBON COMP.
2) ⏚ DENOTES POWER COMMON.
3) CR1→CR4 VALVES ARE IN4151

CHART

IC	TYPE	COM	+5V
U1	74HC266	7	14
U2	14538B	8	16
U3	14011B	7	14
U4	14001B	7	14
U5	MC78L05A		

Figure 6-27
Relay Board Dual Polarity
7-07904002 REV A



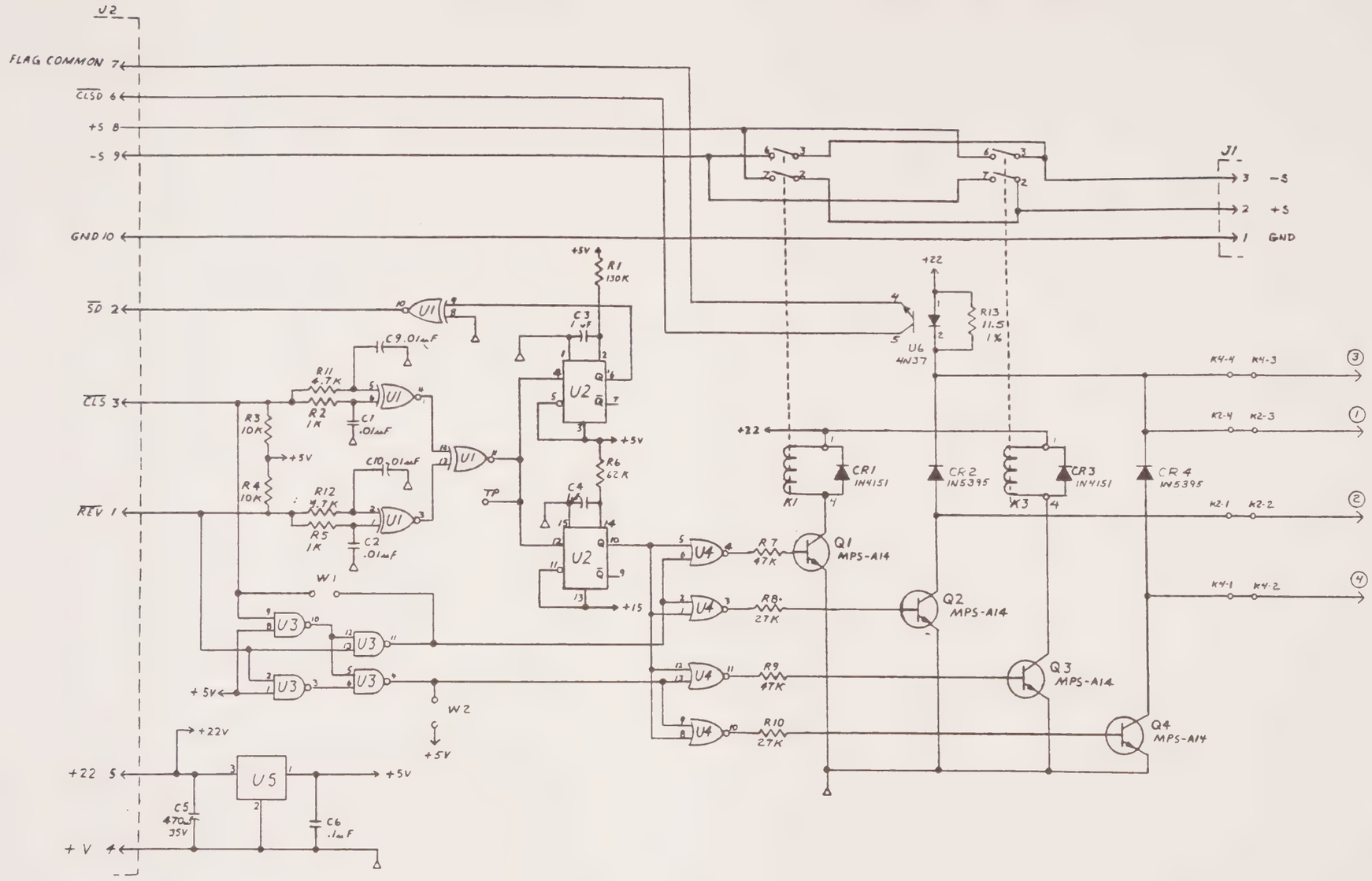
NOTE:
CHASSIS MOUNTED RELAY IS DURAKOOL AFM 220-310, 1HN A COIL. SD P/N 123269

NOTES: 1) RESISTORS ARE ¼ W 5% CARBON COMP.
2) ⏚ DENOTES POWER COMMON.
3)

CHART

IC	TYPE	COM	+5V
U1	74HC266	7	14
U2	14538B	8	16
U3	NOT USED		
U4	1N5018	7	14
U5	MC78L05A		

Figure 6-28
Relay Board, Ext. Relay, Single Polarity
7-07904005 REV A

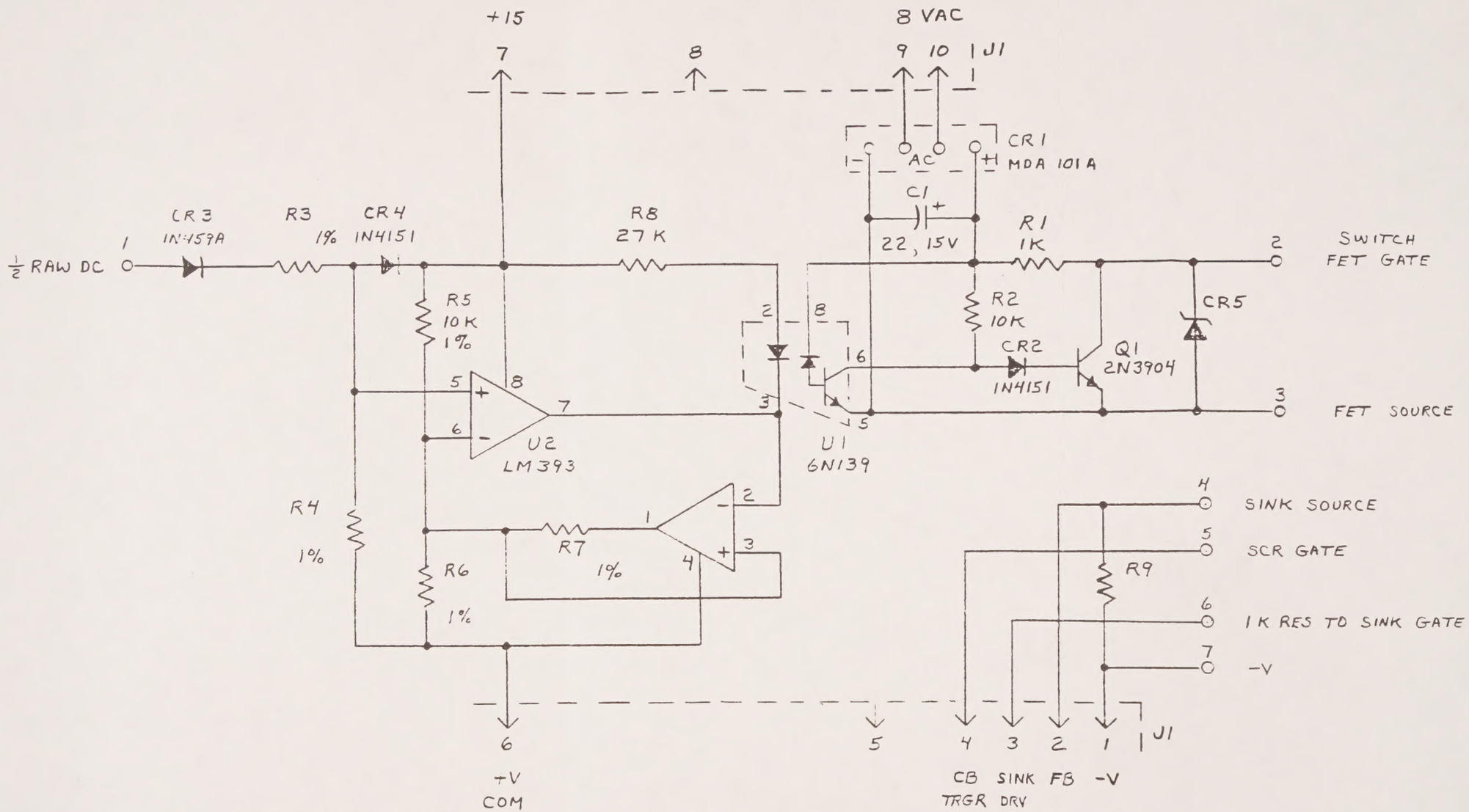


NOTES: 1) RESISTORS ARE ⅛ W 5% CARBON COMP.
2) ⏚ DENOTES POWER COMMON.
3)

CHART

IC	TYPE	COM	+5V
U1	74HC266	7	14
U2	14538B	8	16
U3	14011B	7	14
U4	14001B	7	14
U5	MC78L05A		

Figure 6-29
Relay Board, Ext. Relay, Dual Polarity
7-07904006 REV A



MODEL	R3	R4	R6	R7	R9	CR5
HFP 30-15	10.0 K	10.0 K	1.74 K	2.49K	.51 2W	—
HFP 150-3	80.6 K	80.6 K	4.64 K	2.55 K	2.7 1/2W	IN957B 6.8 V

Figure 6-30
Switch Control PCB
7-079235 TAB REV A

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